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SOME ASPECTS OF THE EVOLUTION OF THE RIVERS EARN AND TAY

By David L. Linton, M.Sc.

The elucidation of the history of a river system, and the reconstruction of the phases by which it has developed to its present condition, is essentially a form of detective investigation. The clues may be drawn from varied fields and many of the most valuable are frequently provided by the researches which geologists pursue for other ends. Their investigations upon the sediments laid down during the later phases of geological time, and on the movements of elevation which these have undergone, provide valuable evidence of the general history of a region and may even suffice to suggest a hypothesis of river evolution. Such, however, is far from being the case in Scotland. Save for the complex and difficult record of the most recent phases, comprising the period of glacial and post-glacial time, the evidence ceases in Central and Southern Scotland with the deposition of the New Red Sandstone. The long ages of the remainder of Mesozoic and Tertiary time are without witness in all the area south of Glenmore, and the student of drainage evolution must derive all the clues he needs from a study of the rivers themselves.

An early beginning was made, however, as far back as 1865, with the observations of Sir Archibald Geikie on the rivers of Perthshire, followed some twenty years later by those of H. M. Cadell on the Dunbartonshire Highlands. On these foundations a hypothesis was built and elaborated in the opening years of the present century, notably by Mackinder, Mort, Peach and Horne. They envisaged the possibility that the present rivers of Scotland have been developed from an original system of streams which flowed from north-west to south-east across practically the whole country. The surface on which these original rivers must have flowed has now disappeared ; as it was destroyed, the present relief features of Scotland—the Highlands, Central Lowlands and Southern Uplands—came into view, and the original rivers were concurrently dismembered. On this view the numerous north-west—south-east

elements in the present drainage system are the remnants which have survived this fragmentation.

Stated thus, the hypothesis seems almost self-evidently true, and has consequently been very generally adopted by later writers. Indeed they have uncritically accepted as a theory what was intended, by Mackinder at least, merely as a hypothesis. Mackinder observed that certain important rivers did not possess the supposed original south-eastward direction of flow : nor did there seem any obvious means by which they might have originated at some later stage. Particularly he instanced the eastward-flowing Dee, Don, Earn and Tweed. This qualification of the original hypothesis has since been virtually ignored, and the nature of the rivers in question has apparently been extensively misinterpreted. Such considerations led the present writer to re-examine the drainage of Southern Scotland in order to throw light on the apparently anomalous character of the Tweed. The result of that investigation, published in this *Magazine* in 1933, was to suggest that, far from being anomalous, the Tweed is in fact the trunk stream of the region, paralleled by the Forth and the Solway-Tyne to north and south respectively. The south-eastward flowing consequents of the earlier writers proved to be the left-hand tributaries of these main trunks, and a group of north-flowing tributaries to the original Tweed were recognised as being of equal antiquity. This arrangement of the original drainage is indicated by the surviving elements represented in Fig. 1, here reprinted from the earlier paper.[1]

More recently, the writer attempted to extend this hypothesis to the territory of the Earn, the second of the streams cited by Mackinder as anomalous. A fruitful beginning was made with the realisation that the dissected high-level depression which runs across the Eastern Ochils from Newburgh towards St. Andrews Bay represented the former course of the Lower Earn, but progress was delayed when further field work in the Western Ochils failed to reveal the expected right-hand tributaries. In time, however, it became apparent that the pattern worked out for the Tweed and its tributaries could not be applied *in toto* to the more northerly region, but that the essential feature of initial eastward flow in the trunk streams was nevertheless common to both drainage systems.

Much of the evidence for this conclusion is drawn from a consideration of the detailed morphology of the Ochil and Sidlaw regions, and is summarised in the succeeding paragraphs.

Glen Devon

In so far as Glen Devon received consideration at all from earlier writers it was always coupled with Glen Eagles, with which

[1] D. L. Linton, "The Origin of the Tweed Drainage System," *S.G.M.*, vol. xlix., 1933, pp. 162-175, which contains a bibliography of the relevant writings of the earlier authors.

it offers an easy road-route through the otherwise unbroken upland of the Western Ochils. This composite transverse trough was naturally cited as evidence for the former existence of a north-west—south-east consequent drainage across the region.

This view was elaborated in 1916 by J. E. Wynfield Rhodes [1] in a series of diagrams representing the evolution of the Devon drainage, and two of these, depicting the first and third of the five stages described, are reproduced here (Fig. 2). The first shows an " upper Devon " flowing down Glen Lednock and up Glen Eagles. On the

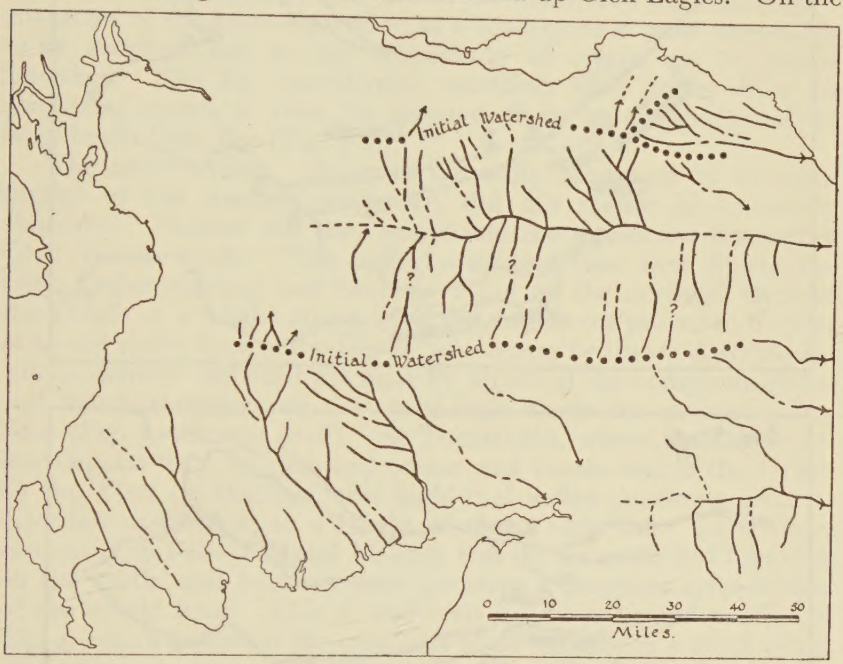


FIG. 1. The Consequent Elements in the Drainage of Southern Scotland.

The continuous lines represent flowing streams which are believed to be surviving portions of the original drainage system. The broken lines indicate the presumed courses of other consequent streams which are now broken.

older view the bisecting of such a stream by the encroachment of the Earn along the softer rocks of the Strathmore syncline is reasonable enough, but it is clearly at variance with any view which regards the Earn as partner with the Forth and Tweed in an original eastward-flowing drainage. Confidence in Rhodes's reconstruction is, however, undermined by the demonstrable falsities of its later phases.

The most attractive of these is a supposed capture by the Lower Devon (a tributary of the Forth) at Crook of Devon in Stage 3. This capture is attributed to the facility with which the pirate stream

[1] J. E. Wynfield Rhodes, "Notes on the Former Courses of the River Devon," *S.G.M.*, vol. xxxii., 1916, pp. 209-216.

might work back along the Ochil fault-line. Yet the low-level trough of the Lower Devon, which follows the fault-line only in a very general way, actually terminates some three miles from the Crook of Devon against a resistant dolerite sill over which the Devon tumbles in the fine fall of Cauldron Linn. Immediately upstream is the slot gorge of Rumbling Bridge, 120 feet deep and so recent

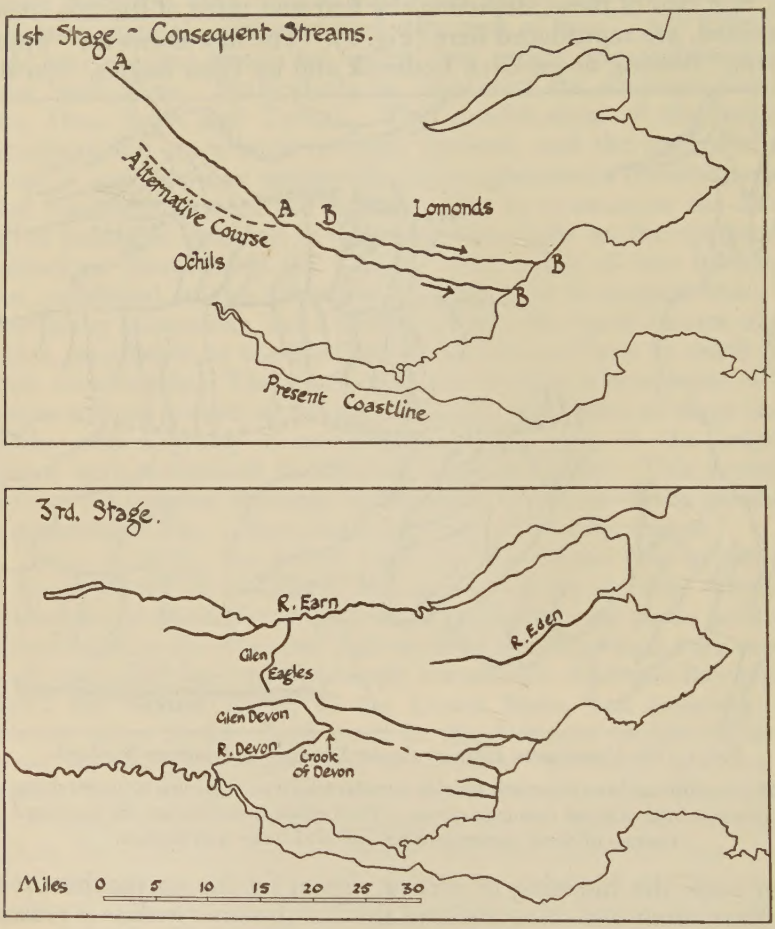


FIG. 2. A Hypothesis of Drainage Evolution for the Ochil Region. (After J. E. Wynfield Rhodes, *S.G.M.*, vol. xxxii. pp. 209-216.)

in origin that fresh potholes are still preserved on its walls eighty or more feet above the stream. This gorge terminates fully a mile below the supposed " elbow of capture," and from its head up to and beyond the " elbow " the gradients are very slight. It is clear that here there has been no active piracy, but a very recent diversion at the margin of a stagnant portion of the last ice sheet.

The later evolution discussed by Rhodes need obviously not be

considered, since it is based upon a false premiss, and we may return therefore to a consideration of the first phase with its "through" stream occupying the Glen Eagles—Glen Devon depression.

When examined on the ground Glen Eagles is seen to be in no sense the head of Glen Devon, but a glacial trough which bursts into it abruptly, mid-way along its northern flank and at a large angle (70°) with its general trend (Plate 1). The two valleys are as discordant in form as they are in direction, and the "through" character of the joint depression as a road-route is most reasonably to be ascribed not to any community of origin, but to glacial lowering. This has considerably modified Glen Eagles from its preglacial aspect, as may be inferred from an inspection of its neighbour, Glen Bee (Fig. 3 *k*).

The older writers, who were naturally impressed by the continuity of this lowland routeway, did not realise its composite character. Neither did they appreciate the significant features of Glen Devon itself. This valley continues due west above the Glen Eagles opening and heads in a col on the northern flank of the Ochils at a height above 1400 feet. This col proves to be part of an old valley floor of the Devon, which may be traced downstream with a definite eastward gradient by means of the composite slopes and bench remnants on the spurs high above the present valley floor (Fig. 3, sections *a*—*h*). At Tormaukin, where the Devon today departs from its eastward course and breaks out of the Ochils by the Yetts of Muckart, this high-level valley continues with its direction unchanged at a height of about 1200 feet. Long spurs run out from Fannyhill and Mellock Hill on the north and Lendrick on the south, and between them preserve a complete cross-section of the whole floor. This is well seen in the projected profiles of Fig. 4, which represent the crestlines of all the hills in a block about nine miles square as viewed from the east. The front of the block, shown in black, is a north-south section through Crook of Devon; the nearer hills, east of the road from Yetts of Muckart to Dunning, are stippled; the further hills are shown in outline only. A strong vertical exaggeration has been introduced to make differences of slope and altitude sufficiently clear. The upland valley of Glen Devon, falling towards the observer and passing over the nearer hilltops, transects the whole block.

A good picture of this high-level Glen Devon is also revealed by drawing "eohypses" or generalised contours to connect points of similar altitude on adjacent spurs and ridge-crests. Such contours are shown in Fig. 5, and they reveal clearly how the old valley cuts clean across the resistant mass of the Ochils in a direct west-to-east line. There can be little doubt that we are here dealing with a genuine fragment of the earlier drainage of the region.

On either side this valley is bordered by east-west watersheds. That on the south passes through the highest Ochil summits; that

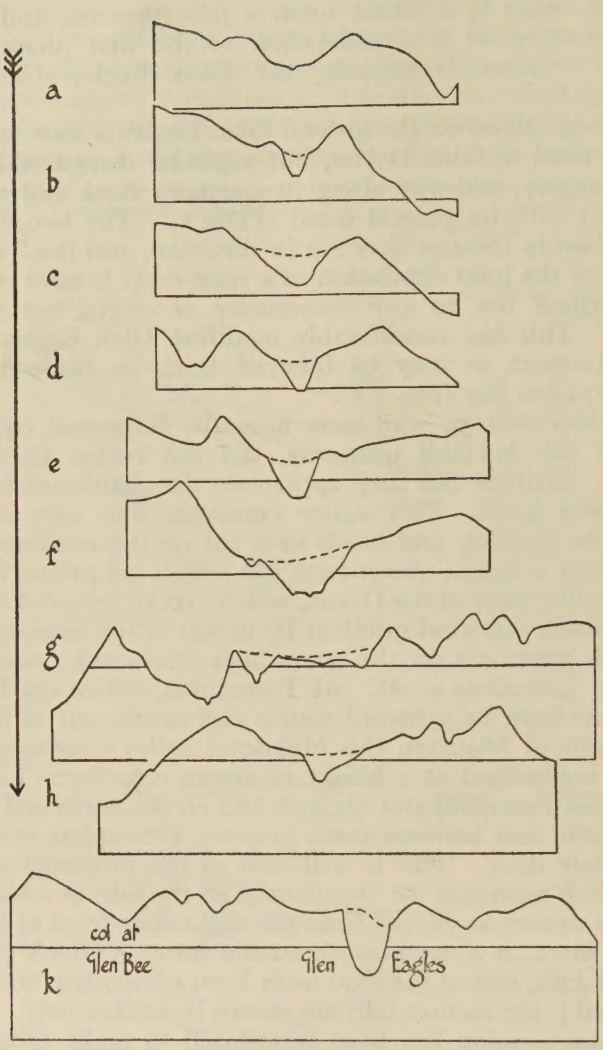


FIG. 3. The Morphology of Glen Devon.

a-f. Series of sections across Glen Devon from the pass at its head to its bend at Tormaukin. The floor of the upland valley discussed in the text is restored by a broken line. The base-line in each case represents an altitude of 1000 feet.

g-h. Similar sections across the presumed continuation of the upland valley east of Tormaukin. Horizontal lines at sea-level and 1000 feet.

k. Profile of the watershed to the north of Glen Devon showing the discordant breach of Glen Eagles.

Vertical scale of all sections five times the horizontal scale.

[*Photo by Valentine Ltd., Dundee*

PLATE I. Glen Eagles, a glacial breach in the Ochil watershed.

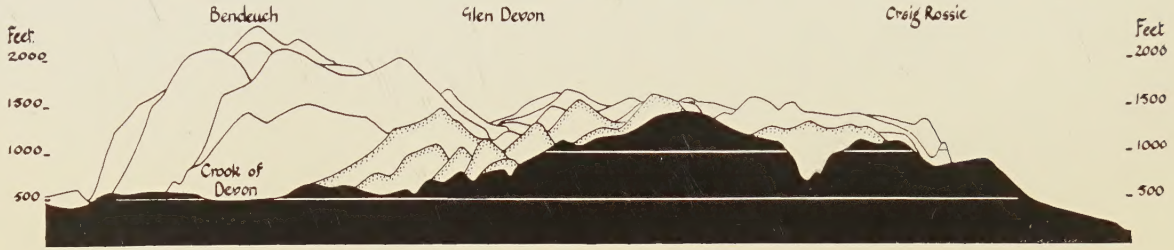
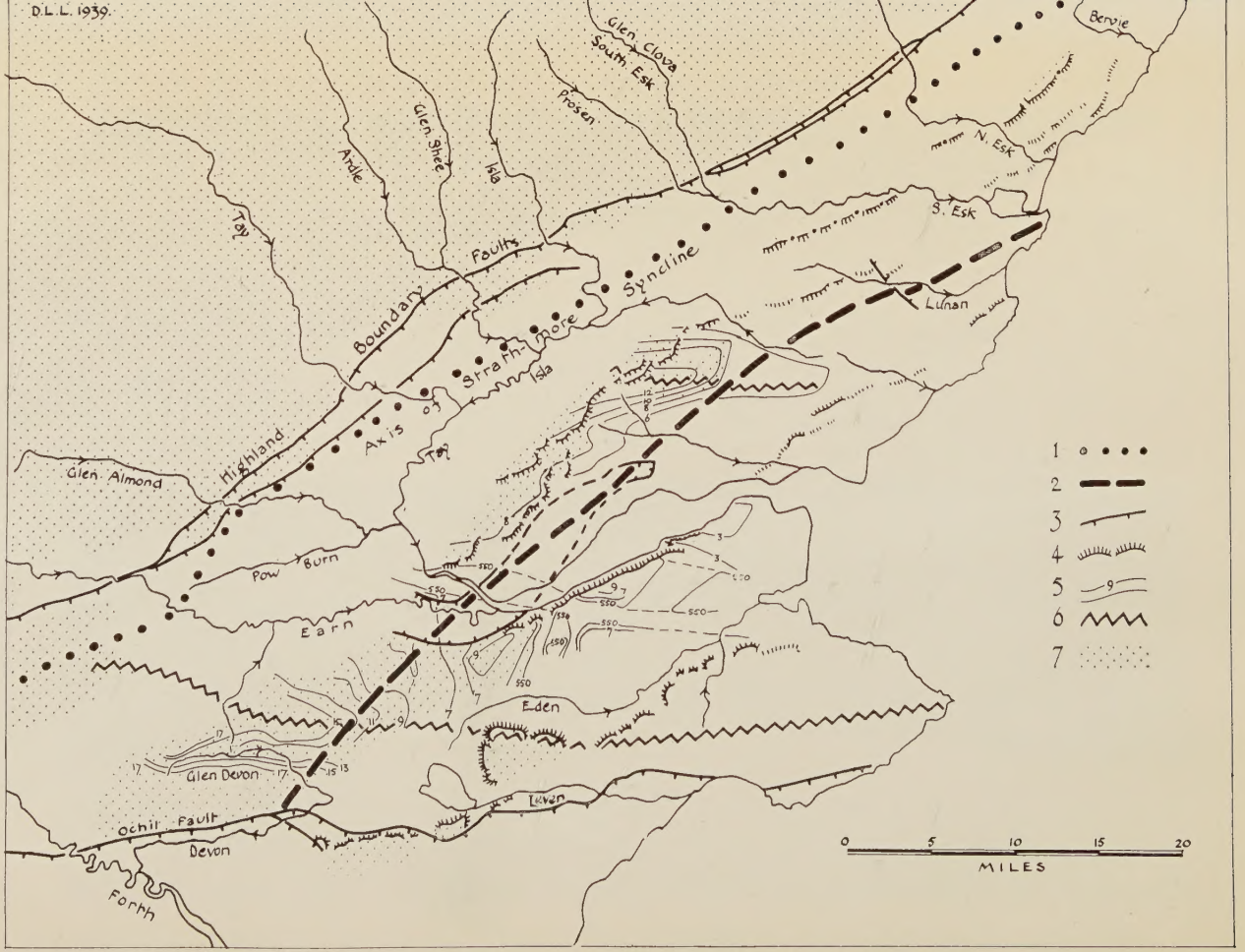


FIG. 4. Projected Profiles of the Central Ochils with the high-level Glen Devon.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Prosen
Glen Shee
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Axis of
Tay
Highland
Glen Almond
Pow
Burn
Earn
Eden
Glen Devon
Ochil Fault
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MILES

on the north is well shown by the eastward projecting salients of the successive generalised contours. Both watersheds behave like the old Devon Valley in passing completely across the mass of elevated ground in a direct line, to be abruptly truncated at the margins of the volcanic outcrop. The eastward continuation of the more northerly of these two lines of waterparting may, however, be sought with some confidence. Beyond the yielding sandstones and marls of the Upper Old Red Series it may be traced through the Carboniferous terrain of East Fife. There it is marked by a line of elevated ground, built of strata of varying age and lithology, which runs through the two Lomonds and over Clatto Hill, and, passing through the most easterly salient of each successive contour, terminates in Fife Ness, the most easterly point of the county. From the West Lomond to the sea is twenty-eight miles, and throughout this distance this line is continuously a waterparting.

It is tempting also to connect the same Ochil watershed in a westerly direction to the high ground of Slymaback and Uamh Bheag, and ultimately with Stùc a' Chroin (3199 feet) in the Grampians. This line would, with two exceptions, everywhere part the territory of the Earn from that of the Forth. The exceptions are such as prove the rule, for they are those of the Knaik headstreams and the outfall of Glen Eagles, and are both attributable to glacial interference.

Strathearn

The watershed just traced runs for nearly seventy miles directly eastwards from the head of Glen Artney to Fife Ness. For the western half of this course it is paralleled at a distance of some half-dozen miles to the northward by the River Earn, and forms the southern boundary of its basin. For the eastern half it limits the basins of the Eden and some smaller streams, but there is good reason to suppose that here also it was originally the boundary of the Earn catchment.

East of Glen Farg, which carries the railway from the Forth Bridge to Perth, the Ochils break down, losing both the altitude and the continuity which they possess farther west, and comprise a series of detached hills rather than a dissected plateau. Valleys seam the region in apparently all directions and are of diverse origins. The chief line of drainage is by the Mottray Water, which occupies a subsequent valley etched out, in part at least, along the

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Key to Fig. 5 (opposite). 1. Synclinal axis of Strathmore.

2. Anticlinal axis of Ochils and Sidlaws.
3. Principal fault-lines.
4. Escarpments, chiefly of O.R.S. and Lower Carboniferous igneous rocks.
5. Eohypses, or restored contours of the upland surface. Figures represent heights in hundreds of feet (some altitudes given in feet).
6. Presumed initial watersheds.
7. Present upland areas.

less resistant outcrops of ash and agglomerate in the volcanic series, while some of the transverse valleys have demonstrably been formed or modified by the overflow of glacial meltwaters from the north-west.

At higher levels some of this diversity disappears, and by drawing generalised contours on a map, or better, by tracing the composite spur slopes and shelf features on the ground, we may discern something of the earlier pattern. The chief feature is a west-to-east depression, one to two miles broad, running from Newburgh in the direction of St. Andrews Bay. It is bordered by ground rising on the south to over 700 feet and on the north to higher altitudes ; the depression itself is not continuous below the level 450-500 feet, though parts of its present floor are much lower. Evidently this trough was occupied by a through-flowing stream which abandoned it only when its floor had been cut down to about 500 feet above present sea-level. Now the gap which is presently occupied by the Tay at Perth has significantly the same magnitude and direction as this depression across the Eastern Ochils. Indeed, the generalised contours defining the depression of Dunbog may be projected directly westwards on to the flanks of the Perth gap (Fig. 5). We may therefore presume with reason that the two gaps were formerly occupied by one and the same stream, though, as will be shown later, there is ground for believing that this was not the Tay. Be that as it may, there is clearly no difficulty in understanding how this stream came to be diverted from the Dunbog depression to follow a course along the unresistant Upper Old Red Sandstone outcrops of the Carse of Gowrie and the Firth of Tay. Two outlets through the now considerably narrowed outcrop of volcanic rocks are offered by the gaps at St. Fort and Broughty Ferry, and capture was doubtless effected by the stream which cut one of these.

At the present time the Earn avoids the Perth watergap and reaches the Firth of Tay by the flat vale, some three miles wide, which is overlooked by the steep slopes above Dron on the south and by Moncrieff Hill on the north. These slopes are fault-line scarps owing their existence to the removal of the yielding red sandstones of the Upper Old Red Series and the Carboniferous shales and marls whose former presence is attested by the small outlier at Dron. This section of the valley may be regarded as due to the growth of a subsequent stream whose upper portion is comprised in the existing Machany Water. The original course of the Earn between Crieff and Perth is thus to be sought on the northern side of the Gask ridge, in the broad valley followed by the railway between these towns and drained very indifferently by the Pow Water.

If this analysis be correct the original Earn ran from its present Highland valley eastward by Crieff, the Perth Gap, Newburgh and St. Andrews Bay, maintaining this direction of flow for over sixty miles. Between it and the primitive watershed some half-dozen

miles to the south we may trace the courses of a number of its original north-flowing right-bank tributaries. One of these, the Ceres Burn in the plateau of East Fife, still preserves its original line practically unchanged ; its present valley is incised below an older, widely-open depression in the low upland. Other examples may be noted in the Ochils between Cupar and Dunning, where they are revealed either by drawing generalised contours on the map, or by a consideration of the spur profiles in the field. Two of these high-level valleys enter the Dunbog depression from the south and are not continued beyond its line. Another may be traced right across the Ochils from Balcanquhal to Aberargie, and it is from this trunk that the subsequent Glen Farg has grown. Farther west the series is carried on by the Water of May and the Dunning Burn. Here the story apparently ends, but two further members of the series may be discerned near the Highland Border. In one of these, a deep " through " valley from the watershed at Uamh Bheag to the Earn at St. Fillans has obviously been bisected by the subsequent Ruchill as it opened up Glen Artney along the line of the Highland Boundary Fault. The second is less obvious, but it also runs from the same east-west watershed to meet the Earn near Comrie. Glacial erosion has, however, scoured a path over the watershed between Cromlet and Corry Our, so that all the upper part of this valley now drains, not northward, but to the south-east, by the River Knaik to Strath Allan. It is thus glacial erosion at its southern end, and erosion by a small stream superimposed long ago across the conglomerate ridges at its northern end, that has given rise to the " through " route traversed by the road from Braco to Comrie.

The Sidlaws

In the light of the conclusions drawn above it becomes of great interest to carry the investigation northwards into the Sidlaws. We have seen that in the region of the Ochils and in the country lying east and west of them the primitive drainage lines were those of the Earn and Devon, trending almost due eastward and separated by an initial watershed of the same trend, which may be traced from the head of Glen Artney to Fife Ness. No writer on the Scottish rivers has ever supposed that the original drainage of the Sidlaw area was other than south-eastwards from the Glens of Angus and eastern Perth, across the line of Strathmore and the Sidlaw axis to the Firth of Tay or the North Sea. The watergaps carrying the Tay at Perth, the South Esk at Brechin and the North Esk at Marykirk, the evident windgap at Newtyle judiciously placed so as to receive the waters of the Ericht or the Ardle or both, and a number of smaller but conspicuous notches in the Sidlaw skyline, seemed ample evidence to support such a hypothesis. It is, however, unlikely that the regions on either side of the Firth of Tay should

possess radically different drainage histories, and some attempt to reconcile the two views is clearly desirable.

A simple expedient which would seem to avoid the dilemma altogether is that of combining the two hypotheses. On this view, while we may allow the Ochil drainage to have been essentially from west to east, the region farther north is assumed to have possessed a regional tilt to the south-east, giving rise to a series of southeast-flowing streams which were successively gathered up by the eastward-flowing streams and carried off to sea. Indeed, it would seem that this view disposes of a weakness of the older theory, for it was never made clear by any of its advocates where the continuations of such southeast-flowing trunk streams as the Tay or the Ericht might be sought south of the Sidlaw axis. Close re-examination of the local evidence, however, does not lend support to this hybrid hypothesis, and a consideration of the evidence from a wider area, which may for the moment be deferred, gives it a definite negative.

Passing north-eastward from Perth by the road at the Sidlaw foot one is bound to be struck by the many and often conspicuous notches in the skyline of the hills. None of these on close examination proves to be a satisfactory windgap leading across the crest to a valley of well-defined character which one might suppose to have suffered beheading. Instead, the whole upland shows the marks of moderately heavy glaciation, and is seamed by irregular groovings, scattered rock eminences, and occasional lochans, of which the Long Loch of Lundie is the biggest. Some of the notches between the higher hills—*e.g.* that between Dunsinane and Black Hills—are evidently U-shaped, and it is difficult under these circumstances to escape the conclusion that the only evidence offered by these features is of the over-riding and erosive action of land ice. A possible exception may appear to be necessary in the case of the gap at Newtyle, so often quoted in evidence. Yet even here the case is, to say the least of it, most uncertain. The actual Glack of Newtyle is a drift-floored, U-shaped trough almost a mile wide between Newtyle Hill and Hatton Hill. In less than this distance it leads through the ridge into a lowland area which contains the actual waterparting, and which opens widely in every direction from south-west to east-south-east. No well-marked valley leads away from the gap, and it is hard to see what definite conclusions may be drawn from it.

While the south-western Sidlaws thus offer little evidence by which any hypothesis of drainage development may be tested, the more northern portion offers helpful clues. The highest summits of the Sidlaw area are Craigowl Hill (1492 feet) and Auchterhouse Hill (1399 feet), and they lie on the only elevated line which may be traced continuously for any distance. It runs significantly due eastward from Kinpurney Hill to Monikie, and throughout this stretch of a dozen miles it forms a local watershed. At its western end it

is built of lavas, and in its central and eastern parts of sandstone, while the axis of the Sidlaw uplift crosses it near Todhills. It is thus a line independent of both structure and lithology, and it is here claimed as a remnant of a primitive watershed between east-flowing consequent streams or their tributaries.

Farther north the ground is lower and the tracing of watersheds would be a futile and thankless task. But the rivers themselves now offer evidence. The most conspicuous gap is that which carries the South Esk from Brechin to the Montrose basin. Peach and Horne regarded this stream as " a subsequent tributary of the North Esk," which, " by working south-westwards along the same weak strata [as the Isla], has tapped the old consequent streams of the Highland Plateau as far to the south-west as the Prosen." This view has been generally accepted by later writers, although it is difficult to see with what justification. From the Highland Boundary at Cortachy to the sea at Montrose the South Esk preserves an eastward direction of flow successively across the upturned conglomerates of the Highland Border, the sandstones of the Strathmore syncline, and the conglomerates, lavas and sandstones of the whole western limb of the Sidlaw anticline. True, the valley is nowhere abruptly entrenched in the features built by the more resistant formations, but that it is none the less superimposed upon them the writer has no doubt.

In the Mearns the gaps of the North Esk and Bervie are clearly smaller examples of the same kind, directed not due east but a little more southerly. Two further depressions which no longer function as outlets from Strathmore also transect the Sidlaws. One of these runs eastwards for a dozen miles from Forfar to Lunan Bay, and is low enough to have functioned as an overflow for meltwaters from Strathmore during the waning phases of the last glaciation. The second is of comparable length and runs from Glamis by Inverarity and Carmyllie towards Arbroath, but much of it is at a relatively high level (about 500 feet) and drains in an obsequent direction toward Strathmore, indicating an early abandonment.

Summarily we may state that the Sidlaws provide sufficient evidence to show that the primitive eastward drainage of the Ochil region was paralleled by a similar system over the lowland portions of Angus and the Mearns. It remains to ask, what was the relation of these eastward-flowing consequent streams to the rivers of the Grampian Highlands ?

(*The second part of this article will be published in the March number of the* Magazine.)

AGRICULTURE IN THE GREAT CLAY BELT OF CANADA

By John R. Randall, The Pennsylvania State College

The Great Clay Belt of Northern Ontario and Quebec is the largest area of potentially arable land in the Laurentian Shield of Canada (Fig. 1), and during the past few decades has become one of the important pioneer settlement areas not only of Canada but of the world. To the geographer the Clay Belt is of interest both as an example of modern methods in pioneer farming and as a problem of land utilisation in a region generally considered inhospitable to the agricultural settler.

In length of occupance and in the appearance of the settled areas the Clay Belt shows its youth. Agricultural settlement, beginning as early as 1877, experienced little vitality until the period 1900 to 1920, during which time the main railroad lines in the region were constructed.[1] At present only about 5 per cent. of its area, or 2000 square miles,[2] can be classed as occupied, and within these settled sections (Fig. 2) is to be found almost the entire population of 81,000 (1931).[3]

Agriculture has always been the primary occupation. Even though the exploitation of natural resources within the region has been considerable, the governmental policies have consistently worked towards the establishment of a permanent farming community. General farming is the dominant type. Indeed, the climate and weather,[4] as well as some economic conditions, make possible little else. Early information concerning weather and climate, based on too meagre observations, indicated that most of the crops common in southern Ontario and Quebec could be grown with certainty in the Clay Belt. Experience has proved that the crop land must be utilised for hay and small grains, and much of the remaining farm land given over to pasture. Weather hazards are probably the most serious handicap, not only prohibiting the production of possible cash crops but on occasion damaging or destroying the staple ones. Lack of markets and distance from possible markets also tend to restrict crop specialisation. Many of the farms have progressed little beyond the subsistence stage, and a tendency towards dairying is the only indication of a change from the economy of general farming.

The Farm

The farmery [5] is the heart of the farmstead in a region of many similar farms. Containing, besides the farm buildings, a garden, barnyard, and occasionally a front yard, it is usually not more than an acre or two in extent and almost universally is located directly

back from the roadway. The size and number of buildings may denote either length of occupance or degree of prosperity, since there are both large and well-kept buildings in sections of recent settlement as well as in those of older occupancy.[6]

Distinctive house types, with the possible exception of the log cabin, seem to be lacking. Most dwellings are of the kind one unconsciously terms " the average farm house " : a rectangular, box-like structure, with or without porches, a type that gains individuality only because of its numbers (Plates 1 and 2). There are, however, a great many variants depending upon elaboration

Fig. 1. The location of the Clay Belt in relation to surrounding regions.

of ground plan, direction of roof-tree, presence of gabled structure, or lack of a pitched roof. The average size of the farm house is small or medium ; two-storey structures are more common than single-storey ones, and wooden houses are in the majority. The outer walls may be clapboarded, or covered with boards of uniform thickness and width placed on the framework horizontally, vertically, or diagonally. Probably more houses are unpainted than painted, and some are covered with tar or building paper. Log cabins, small, shack-like one-storey houses, and the larger but unpainted farm houses all reflect the newness and rawness of a recently settled area.

In contrast to the houses the barns are large, in many cases actually as well as relatively so. The inverted-V type of roof is general, though many of recent construction have the gambrel roof (Plate 3). The greatest number of large barns is found in the southern areas where settlement and dairy development are most advanced.

Surrounding the farmery and continuing for some distance behind it are the arable fields and improved pasture ; beyond these again are the wooded sections. In the longer-settled areas continuous cleared land along the roadways is common ; in the more recently opened areas groups of several farms or individual ones may be separated from one another by forest that fronts the roadway. As a rule the arable fields and improved pastures are rectangular in shape, square or bluntly oblong in Ontario and approaching a strip character in Quebec, a variation resulting from differences in the land surveys of the two provinces. Topographical irregularities may interrupt their pattern.

The average size of farms in the Clay Belt is 148 acres, apportioned as follows : (in the southern areas) crop land, 28 per cent. ; improved pasture and fallow, 5 per cent. ; unimproved land—woodland, natural pasture, marsh, and waste—67 per cent. ; (in the northern areas) crop land, 15 per cent. ; improved pasture and fallow, 4 per cent. ; and unimproved land, 81 per cent.[7] Of the farm land in crops, hays and grains comprise 96 per cent. The remaining crop land is in roots, vegetables, and small fruit. The grains, in order of acreage, are oats, barley, and wheat (Fig. 4). There are also small amounts of rye, flax, and buckwheat.

Within each of the settled areas these leading crops are common to all farms. Variation in density results primarily from degree of farm development, and secondly from climatic, soil, and drainage conditions. Wheat is more important in the southern areas where development is further advanced and climate milder, while in the newer, northern areas hay crops occupy a larger proportion of the cultivated land. Although the percentage of crop land in grains other than wheat varies from district to district, the total acreage is not greatly different between the areas in each of the two major divisions of the region (northern and southern). Timothy and clover, as the leading tame hays, are grown either together or singly, and are as widespread in one area as in another. Alfalfa and grains cut green for hay are of minor importance. Destruction or damaging of the grain by adverse weather conditions occasionally increases the amount cut green.

With few exceptions the remaining crops are grown in the farmery gardens. Of such minor crops potatoes have the largest acreage. Although well suited to the weather and soil, they have importance, as yet, mainly as a food crop for the individual farm family. Small amounts, however, are sold for cash or bartered for other produce. The vegetable garden is universal throughout

PLATE 1. A typical Clay Belt farm house. It has the characteristic pitched roof and the barns are good examples of the inverted-V roof type.

PLATE 2. A Clay Belt farm house with a flat roof, showing the extremely box-like character of many of the houses. The flat-topped variety is quite common.

PLATE 3. The gambrel roof barn, a type which is increasing in numbers in the Clay Belt. Almost all barns recently built are of this type.

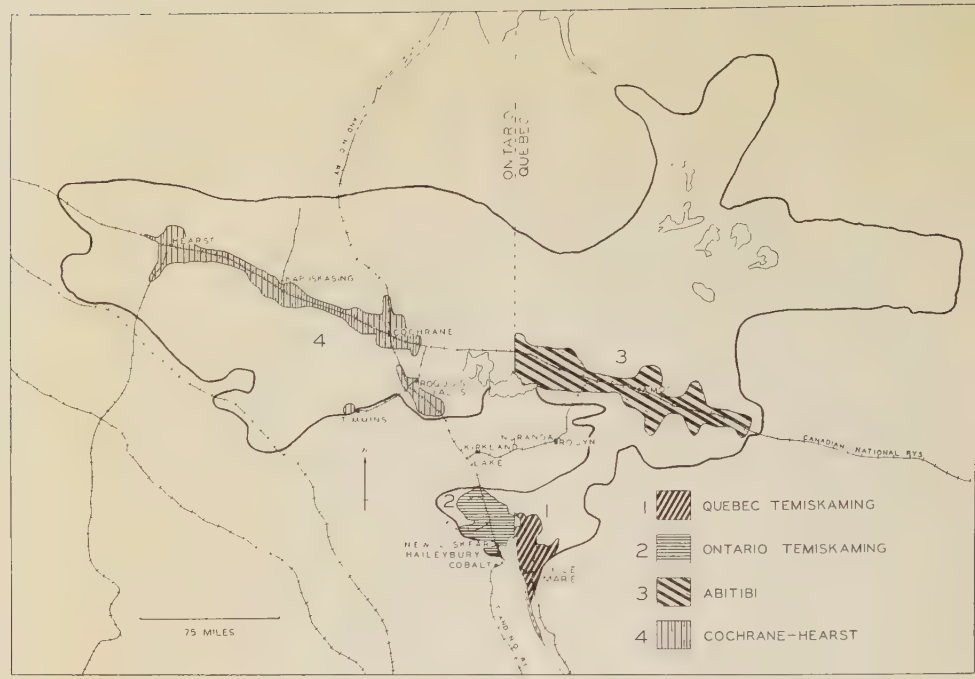

FIG. 2. The settled areas and subdivisions of the Clay Belt.

Latitude and the provincial boundary bring about the divisions within the region. On the map, Nos. 1 and 2 comprise the southern division, Nos. 3 and 4 the northern. The provincial boundary creates two Quebec areas (Nos. 1 and 3) and two Ontario ones (2 and 4). The southern sections have some similarities because of latitude, but differ because of the boundary: the same is true of the northern sections. In general the differences between the Ontario Temiskaming and Cochrane-Hearst, or between the Abitibi and Quebec Temiskaming, are natural, but those between the Abitibi and Cochrane-Hearst, and between the two Temiskaming areas, are cultural.

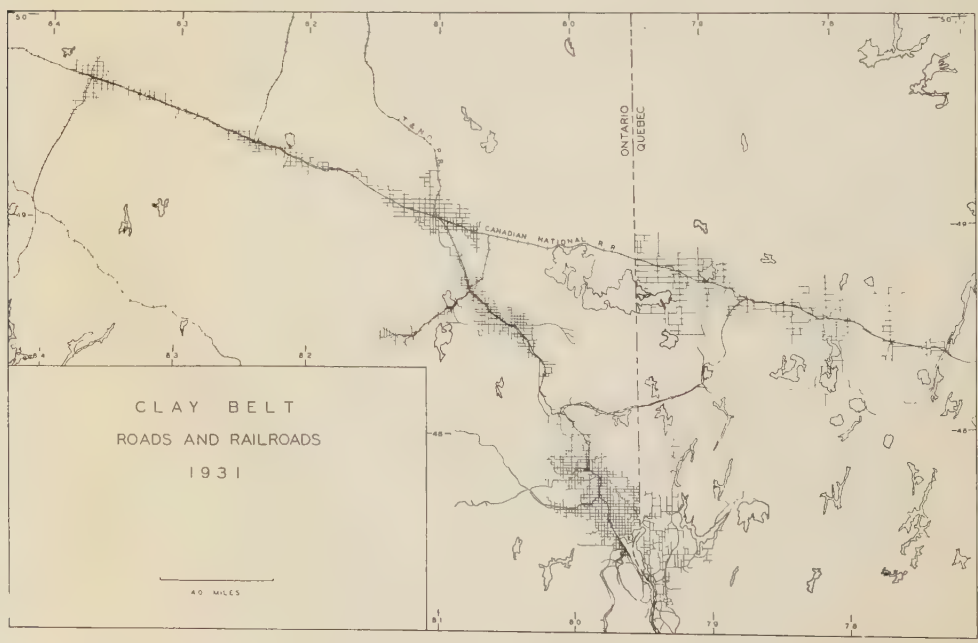

FIG. 3. The relation of the settled areas to the chief means of communication is here very apparent. Compare with Fig. 2.

the region, and the quality as well as the yield of the vegetables is high. All the common varieties, except maize and tomatoes, do well, and this food, fresh in summer and preserved in winter, forms a large part of the farm diet.

Cash crops do not play a very large part in the farm economy. This is a consequence of the lack of nearby markets, and also of the fact that the produce sold for cash is raised rather widely throughout the region, making local demand for it small. The larger part of

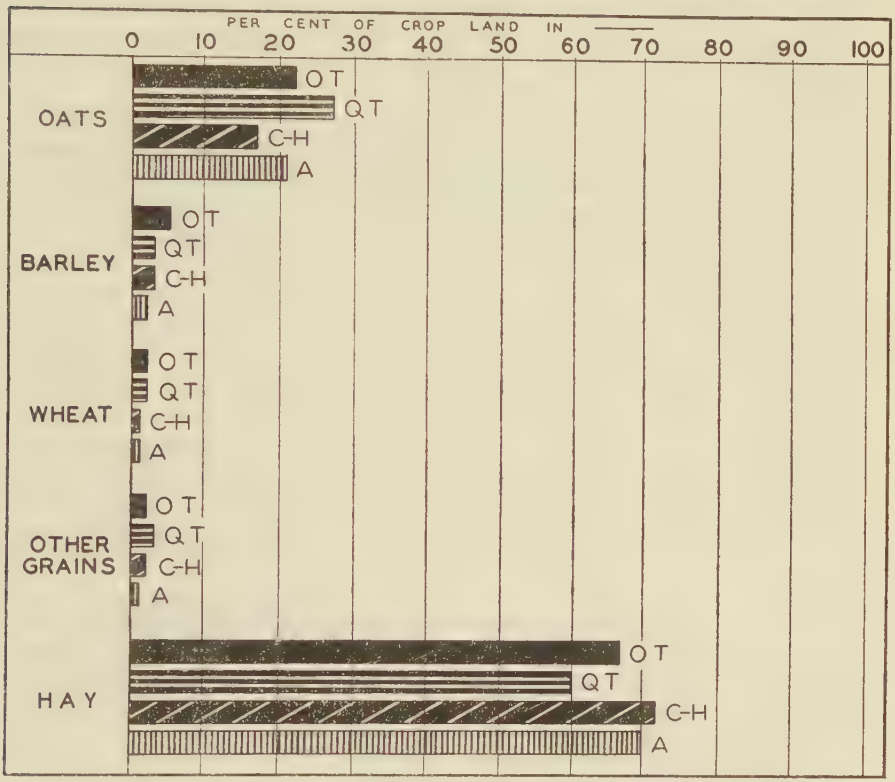

FIG. 4. Percentage of crop land in the leading crops. The initials at the end of the bars have reference to the four subdivisions of the Clay Belt (Fig. 2).

the cash crops find their outlet in the mineral districts on the southern margin of the Clay Belt and in the agglomerated settlements. At present wheat is the leading cash crop ; others of some importance are clover and hay seed, small fruit, honey, peas for canning, and garden vegetables.

Pasture makes up a large portion of each farm and is the chief type of forage during the summer months. The amount of improved pasture is small—about 2 or 3 per cent. of the farm land—and is not necessarily ploughable. Though most farms have some pasture that has a grass cover only, much of this type contains stumps.

Improved pasture is located either near the farmery or between the cultivated fields and the forest, a position implying that part of the farm is in process of being cleared. Woodland pasture is the most important areally, though figures showing the amount of woodland actually pastured are not available. Forest that has been partially thinned, stripped, or burned over contains a considerable amount of forage in the form of grass and clover, established following the cultivation of these tame hays on the farms. Clover and grass along the roadways are also utilised, as are the hay fields after harvest. Because of the cool, moist summer the pastures rarely become dry, and normally the livestock may graze in them from late May till October.

The average number of cattle per farm is 8·4, of which a little less than half were producing milk in 1931. The southern areas have considerably more cattle per farm than have the northern ones (Fig. 5), and also a larger percentage of pure-bred and grade animals. Holstein, Ayrshire, and shorthorn are the leading types. Although there has been a trend throughout the Clay Belt towards improved stock the cattle of mixed and common heritage are still predominant. Because the region is suitable for dairying and because much beef is imported each year, officials of the agricultural stations urge the use of dual purpose cattle, and this will quite possibly become the general practice. Hogs and sheep are relatively unimportant in comparison (Fig. 5). There is a more even distribution of hogs than of sheep, since the latter in the northern areas suffer depredation by wolves and husky dogs. With increased settlement, however, the trend is towards more hogs and sheep—an attempt to produce the local meat supply and to raise the farm income.

Horses are the chief type of draft animal, though oxen used for this purpose are not uncommon. In general the horses are large, powerful beasts, and because they are so vital to the farm are well cared for. These animals are used not only for work in the fields and forest but are the main means of transport as well.

Farm Problems and Practices

The farmer of the Clay Belt in his attempt to establish and maintain a farm faces a number of difficulties. Certain natural and economic factors may cause him to abandon or radically to alter the methods of farming to which he was previously accustomed. Problems presented by the forest cover and by conditions of soil fertility and drainage are not difficult to overcome ; to others, such as climate and weather, adaptations must be made. Likewise, markets, transportation facilities, and utilisation of natural resources are of considerable consequence in the farm economy. These last, however, have a contemporary significance which may change. Types of weather and climate, remaining constant, assert a more enduring influence. The immediate importance of climatic con-

ditions lies largely in the limitations they place on land use, and on the farm practices that have evolved because of them.

The Clay Belt as a whole has a humid microthermal climate.[8] The majority of weather stations for which data are available have four months with temperatures above 50° F.[9] The hot month temperatures vary between 61° and 67° F., and those for the cold months between 7° and −3° F. The production of temperate grains, then, with the exception of maize, is theoretically possible ; though experience has shown that these staple crops cannot be produced with certainty every year. This painful fact is borne

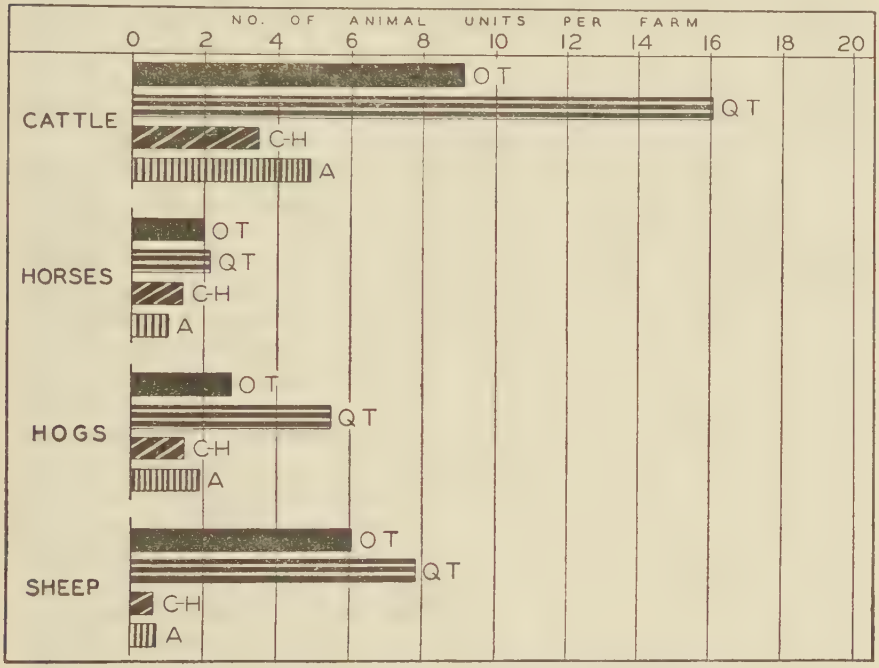

Fig. 5. The number of livestock per farm for the four subdivisions of the Clay Belt. In each case the number of animals per unit is one.

out not only by crop failures, but also by the evidence of accumulating weather data. Variability of the length of the frost-free season and abundance of late summer and early autumn precipitation are the two weather phenomena that cause most trouble.

The average length of the frost-free season varies from 113 days in the south to 59 days in the north ; the majority of the region has 80 days or more free from frost. The yearly variation of this period, however, is the critical factor : at any time during the normal growing season temperatures may fall below freezing ; one station only in the Clay Belt does not show such figures. Since future settlement will be heaviest in the northern areas, it is of especial concern that these sections are the ones in which summer frost is

most likely to occur.[10] Probably the most effective antidote is the development of varieties of crops that to some extent can withstand this condition.

Of similar consequence is late summer and early autumn rain. The months of August and September have somewhat over 22 per cent.—6·58 inches—of the annual precipitation. Both the rain and the temperature and cloud conditions that accompany it are commonly detrimental. Several days of drizzle along with and followed by relatively low temperatures and a clouded sky may keep grains and hay from ripening or wet them so that they cannot be dried prior to partial spoiling. In this way, crops may be completely ruined or damaged sufficiently as greatly to reduce their value.

One climatic factor tends to alleviate the above conditions to some extent. The duration of sunlight in summer is considerable and the area receives more than 50 per cent. of that possible.

The most conspicuous feature resulting from the length of the cold season is the size of the barns. Very large quantities of hay and grain are needed for the long indoor feeding period of winter. This is reflected not only in the actual size of the barns but also in the increasing number of the gambrel roof type which has a greater storage capacity than the inverted-V roof type.[11] Other less prominent features are the large piles of wood for fuel, snow fences along the roadways, the banking of house foundations with straw, the ubiquity of the husky dog—a means of locomotion in winter—and the clothes line that is strung up from 10 to 15 feet above the ground, high enough to keep drying garments out of snow drifts.

Because of the shortness of the summer the ploughing and preparation of fields must be done after harvest, in order that the seed may be planted at the earliest opportunity in the spring. Although this is a general custom in much of the United States and Canada, it is practically mandatory in the Clay Belt. Another effect of the short growing season, and one that seems most out of the ordinary to an observer from the south, is the simultaneous ripening of the majority of crops. Ripe oats or wheat is being cut at the same time as hay in the next field. This gives rise to a conspicuous uniformity of colour in summer : during most of the season there is a landscape of varying shades of green, both in the crop fields and in the forest ; then follows a short period in which the yellow or ripening grain is predominant ; and finally one with the brown of ploughed fields standing out in contrast to the dark green of conifers and the brilliant yellow and orange of the hardwoods.

Although the end of the summer, with the harvesting of crops, the ploughing of fields, and the preserving of food for winter, might seem the time of most intensive activity on the farm, the whole of the season is a very busy one. Spring planting gives way to summer cultivation and the work connected with the development of the farm properties. Of the latter, the most important on many of the

farms is the process of land clearing. Upon this is dependent not only the amount of land available for crops and pasture but also much of the farmer's cash income.

The process of land clearing, though a long and disagreeable one, is not particularly difficult. The majority of the common trees [12] have root systems that are relatively shallow, so that their stumps may be easily removed with the help of a team, after which deep ploughing turns up many of the roots. Stumps of larger trees are usually left in the fields and pasture and crops planted around them. Several years of decomposition allows their easy removal. The forest may be cut in any season but the stumping can be done only in summer. A farmer can clear from three to five acres a year, depending upon the amount of help he may have from his family. At this rate, seven to ten years are needed for farm development before crops return an income large enough to support the family. The sale of timber and pulp bolts obtained in the clearing process is one of the chief sources of income during this period.

Like forest clearing the problem of soil fertility and drainage is not a difficult one. The clay soils were derived for the most part from the sediments of the James Bay Lowland. In the form of lacustrine deposits in the southern areas, and largely of till in the north, the soils tend to be compact and somewhat heavy. They contain, however, a sufficiency of the essential plant minerals, with the exception of phosphorus, to be productive, and are especially rich in lime.

At present only in the areas of longest settlement has there been any sign of soil depletion from constant cropping, and this condition may be remedied by crop rotation or by the application of animal manures and small amounts of commercial fertilisers. In the more recently opened sections, soils show little sign of depletion and rotation is not necessary, nor is it as yet possible, because of the lack of crop land. When available, animal manures are in general use throughout the region.

The clay soils, because of their compact nature and because of the levelness of the topography, are often poorly drained and aerated and also may be covered with a layer of peat. Practice has shown that all three of these handicaps may be overcome by methods of ploughing. Deep ploughing, as we have seen, is used to remove roots. This process also mixes the peat and the clay, to produce a soil less compact, better aerated, and more easily drained, as well as one not less productive because of its peat content. In places where peat is too deep for ploughing to reach the clay, the soil has been found suitable for some types of hay or pasture. Occasional muskegs are too large and well developed to be profitably drained, and can be used in some cases for pasture, but more often are considered waste land. On the whole, where clays are poorly drained, and whether they are peat covered or not, the free movement of water can be much improved by a system of ploughing that is now

in comparatively wide use. The ploughing is done in such a way that the fields are divided into a series of strips having concave surfaces and a width of from 20 to 30 feet. After a field has been prepared in this manner for a few years, the crown of the strip is 2 or 3 feet above the furrow on either side. Thus enough slope is attained to remove the surface water without the accompanying danger of slope wash and gullying.

Cultural Factors influencing Farm Economy

The provincial governments of Ontario and Quebec have done much to foster agricultural settlement. This is especially true of Quebec, which has sought in the Clay Belt an outlet for the excess French-Canadian population of the St. Lawrence Valley. Besides conferring the usual benefits of educational and health facilities, roads, essentially free land, and various types of loans, the governments have placed regulations on the minimum size of houses and barns, the amount of wood that can be cut from the farms and Crown lands, and, in the case of Quebec, to whom the timber may be sold. Quebec pays cash subsidies for the clearing and ploughing of land as well, and while these do not amount to a great deal for any one farmer, the total outlay is considerable.[13] This means not only an increase of cash within the region, but a decided help to settlers in the early stages of farm development, especially to those on whose land the forest cover has been damaged or destroyed.

Transportation facilities within the region and connections with the surrounding areas are fairly adequate. The main east-west railroad—passing through the northern part of the Belt—is a segment of the Canadian National transcontinental line, and the north-south railroad, the Temiskaming and Northern Ontario (Toronto to Moosonee), connects the northern and southern parts through Cobalt and Cochrane (Fig. 3). Branch lines connect with other main Canadian systems, and others tap the mineral districts on the margins of the Clay Belt. The greatest handicap to rail transportation is less a matter of the paucity of lines than of the distance from consuming areas, with resultant high freight rates.

Because of the way in which land is opened for settlement, few farms are any distance from roads.[14] In general the longer settled areas have the closest meshed road net (Fig. 3), but none of the settled areas is lacking in necessary routes of transportation. The few main highways are surfaced with gravel or crushed rock, and with the possible exception of times of snow drifts in winter are probably passable throughout the year. Secondary roads, in the areas of older occupancy, may also be surfaced, but are in general decidedly inferior. Passable when dry, many of the newer roads are in poor condition after rains ; largely dirt surfaced, they become easily packed or rutted, causing movement to be slow and in some cases difficult. Since most farm traffic is horse-drawn, the above

conditions are not actually as bad as they might sound to a motor-minded person. Wagons in summer and bob-sleds in winter rarely get mired or skid on even the poorer roads. New roads, improved surfacing, and the fairly constant care of existing roads present problems the provincial governments are doing their best to solve.

Although agglomerated settlements are quite numerous, they are small.[15] Only where a large part of the population is engaged in work other than farming do these towns and villages consume much of the local farm produce. Among towns of this type are included the paper and pulp mill towns, administrative and railroad centres, and in one or two instances those that have some tourist trade.

Of greater importance are the agglomerated settlements of the mineral districts on the southern margins of the Clay Belt. Some of the most important mining areas in the Dominion, these sections —Porcupine, Kirkland Lake, Cobalt, western Quebec, and associated districts—contain a population of approximately 60,000 that is largely non-farming in nature, and as such provides extremely good markets for farm produce. The increase in mineral production in these areas has been reflected in the better business conditions within the Clay Belt in the past few years. Profitable years in the Clay Belt are closely related to similar times for the extractive industries, and the converse is equally true. As long as the extractive industries continue to be important—as they are likely to—the Clay Belt will continue to grow as a farm community.

Relation of the Extractive Industries to the Farm Economy

The importance of the extractive industries to farm development goes further than that of simply forming markets for agricultural produce. They are also outlets for forest products from the farms, give employment to settlers, and in various other ways help to support and develop occupancy in the Clay Belt. Lumbering, paper and pulp production, water-power development, and mining are of chief significance, while trapping holds a minor position. Emphasis here is placed mainly on the relation of the extractive industries to agricultural development rather than on the industries as such.

The forest resource probably more than any other has been the foundation on which agricultural development has been built. Coincident with the opening of the region was the exploitation of the forest by lumber concerns. Farmers followed the lumber operations, developing their land with funds earned from labour in the forest or sawmills, and with that obtained by the sale of farm produce to the companies and to the populace of the agglomerated settlements dominated by the lumber industry. Lumbering, however, did not long remain of major significance. The forest did not contain sufficient stands of timber to maintain the industry, and those sections of the Clay Belt that had the largest supply of lumber

timber were the first to be settled, so that much of the land was not available to timber lease or sale. At the same time, and as the result of logging and farming activities, large areas of forest land were destroyed by fire. Also, the location of most of the region north of the height of land presented difficulties to the use of rivers in floating logs to the mills.

At present the lumber operations of any size are located in the southern parts of the Clay Belt, south of the height of land and predominantly outside the settled areas. In the Ontario sections there are only two mills that have a capacity of over 20,000 board-feet per day, and in the Quebec areas there is only one of such size. The major part of the present lumber output is produced in small temporary mills scattered throughout the developed areas. The logs for these mills come largely from the wooded sections of the farms, from which the owners cull the best timber to sell outright or to have sawn for use in farm buildings. There are approximately a hundred such small sawmills in the region, each with a capacity of a few thousand feet per day ; but these mills saw timber only occasionally. They are rather inconspicuous features : saws and engines housed in rude temporary structures, and the logs, lumber, and waste piled about the mill.

Although there has been some increase in production in the last few years because of the increase in mining, it is improbable that lumbering will ever regain its former position. Farmers can obtain most of the lumber they need from their own land, so that local demand is relatively small ; but more important is the fact that the remaining forest cover, in spite of areal extent, does not contain sufficient trees of lumber size. At present, in the Ontario areas of the region, less than 5 per cent. of the forested area is under timber lease. Whereas the figures for Quebec are not available, there is little reason to believe that the amount there is much different.

With the decline of lumbering there has been a steady increase in the output of pulp bolts for paper and pulp. Some of the factors that hinder lumber production are advantageous to the pulp industry : small trees are as good, or better, for pulp bolts than larger ones ; the number of species in the forest that can be used for pulp is greater than that suitable for lumber ; where streams are not available for floating bolts they can be carried, more easily than timber, by wagon and train ; and lastly, the presence of large numbers of settlers is a help rather than a disadvantage, since in many cases bolts can be obtained more cheaply from farmers than they can be produced from company lands.

The paper and pulp industry has become of greater significance to agricultural settlement than lumbering, and will remain so, since the supply of wood for paper is so much larger than that for lumber and the settler usually has wood that he can sell directly to the pulp mills. A large part of the wood cut in the process of land clearing is suitable for pulp, and the sale of such wood is general

over the whole region though more especially in the north. Piles of bolts awaiting shipment are a common sight, stacked not only along the railroads but also in smaller quantities in many of the farm yards. At the mills, great conical heaps of bolts are conspicuous landmarks, and the streams on which the mills are located are periodically clogged with them.

There are three paper and pulp mills in the Clay Belt, with a total capacity of 1100 tons of newsprint and 350 tons of pulp per day.[16] The production of pulp wood is larger, however, than the amount consumed by the regional industry. That cut in the Ontario areas has its destination in other Dominion mills or in the United States, and that from Quebec by government regulation must be processed within the Dominion.

The policy followed in the Clay Belt is one that puts emphasis on the intelligent use of the present forest rather than upon the replacement of trees cut. The regulations on the cutting of timber are as much to ensure the settler some income over a number of years as to preserve the forest cover. Much has been done to control the ravages of forest fires, but little has been accomplished in replacing the wood destroyed by the logging, pulp, and farming operations.

There is little direct relationship between power development and agriculture, but because mining and paper production are so dependent on power it indirectly affects agricultural development. The developed power sites—found both in the settled areas and in the forest regions beyond them—have a capacity of 560,200 h.p., and other stations within a few miles of the Clay Belt margins have a capacity of 53,980 h.p. Of this total all but 40,740 h.p. is generated in the Ontario areas, and the majority of the dams are on the Mattagami, Abitibi, and Montreal rivers. Within the region the paper and pulp mills are the chief users, and all three such plants are located at power sites ; the agglomerated settlements are probably second in the amount of power consumed, and the farms a very weak third, there being only 113 farms in the entire area that report the use of electricity. Transmission lines carry power to all the mining districts on the southern margins of the Clay Belt and to the Sudbury District beyond.

The mining industry exerts mainly an indirect though important influence on the development of the Clay Belt. For the most part there is too deep an overburden of drift to make prospecting and the development of deposits profitable there so long as those in the surrounding Shield are so easily available. The mineral districts on the margins of the region, however, are highly important to its development. The exploitation of the Shield minerals dates from the construction of the railroads.[17] Almost from the beginning of agricultural settlement the mineral districts have served as markets, have given employment to settlers, and have done much to support the railroads that serve the Clay Belt. Because of the capital

invested and the money paid out by the mining and paper interests, the farmer can aspire, at least at present, to a degree of development above that of mere subsistence, a condition which is likely to continue as long as these industries are profitable.

With the expansion of farms the fur-bearing animals have migrated into the forest areas to the north and south. Few farmers trap animals to obtain money for land development to-day. Indians are the principal ones interested in this industry, and each spring they bring pelts to the Hudson's Bay Company posts located in the region. The value of the catch, however, has declined in recent years.

Farm Values

An examination of farm values in the Clay Belt not only reveals the contrast between that area and others, both in Canada and the United States, but also epitomises the present agricultural conditions within the region. The total value of the average farm (Table I) is approximately double that of the poorest in Ontario and Quebec, but only one-half to one-third as great as many in the Great Lakes–St. Lawrence region.[18] An analysis of the major farm values by subdivisions brings out very clearly the higher development of the two southern areas (Table I). This condition is to be expected in view of the milder climatic conditions and the longer occupancy of those areas. In comparison to the value of farm produce in the highly developed agricultural regions of Canada and the United States, that of the Clay Belt seems meagre indeed. And when one realises that relatively little of the farm produce is sold for cash, the subsistence nature of many of the farms is even more apparent. Although the figures for the value of individual crops (Table II) are average ones, they do not vary much from the true conditions, since the majority of farms produce largely the same crops.

In farm produce the two southern areas again stand out as superior to the northern ones. The total value of all crops is greater, especially so in the case of wheat, clover and grass seed, and peas, all of which are grown for cash. The same condition of value is apparent for livestock and animal products (Table III).

Milk makes up the largest single item under animal products. This probably is a reflection of the growing tendency towards dairying, though the condition of the dairy industry is not especially robust at present. The milk, other than that used on farms and that sold for urban consumption, is turned into butter or more often into cheese. Butter is made on the farms as well as in creameries, but cheese is produced largely in factories. There are 11 dairy establishments in the Ontario sections and 19 in the Quebec ones ; 17 of these 30 are in the two Temiskaming areas and the rest further north. The markets are local and in the adjacent mining areas.

When appropriations allow and when certain conditions are met by the operators, the governments pay subsidies for the opera-

tion of dairy establishments. None of the creameries or cheese factories in the Clay Belt is subsidised at present. This may or may not mean that they are profitable without government aid. Since the Quebec Department of Agriculture considers the Abitibi and Temiskaming areas as deficit sections from the dairy production standpoint, it would appear that in these areas at least dairying is still decidedly in its infancy.

The other source of income for the farmer is from the sale of wood. Although a considerable amount of timber is used on the farm, much more is sold for cash (Table IV). An analysis of the value of forest products for the four subdivisions of the region shows a condition opposite to that found for farm produce : the northern areas are in this connection most important, and that largely because of their more recent settlement. The percentage of farms reporting sales of wood is high for the whole region but somewhat higher in the north than in the south. The larger percentage in the Quebec Temiskaming area as compared to that of the Ontario Temiskaming is probably due to the regulations placed on the cutting of timber that were in force considerably earlier in Quebec than in Ontario.

Conclusion

With a farm of low value, a small cash income, and a process of farming that must be adjusted to adverse climatic conditions, to what can the Clay Belt farmer look forward ? Numerous problems must be met before he can be sure of the future : the assurance of sustaining crops ; the questions of markets and transportation ; of natural resources and their exploitation ; of isolation from more populous regions ; and others of almost equal importance. At present much is being done to develop crops that can mature under existing weather conditions ; markets are at their best in years, but will keep thus only so long as forest exploitation and mining remain both profitable and close at hand ; transportation, though not what it might be, has been constantly improved ; isolation, in this case, is something very difficult to change. Sided with the farmer in his attempt to wrest a living from the land are some equally strong factors : his willingness to work hard and long for little in return ; the eagerness on the part of the government to settle the region ; the capital already invested ; and the productivity of the region since its opening in spite of the many handicaps.

One seems fairly certain in saying that even with the adverse natural features that exist, and with the possibility of present markets disappearing, the Clay Belt will continue as a farming community. The present rate of development may cease and a purely subsistence type of farming take its place, but at least the farmer in this region need not look forward to becoming stranded and poverty-stricken as have some who attempted farming in other parts of the Laurentian Shield.

TABLE I

Division.	Value per Farm, in Dollars, 1931.					
	Total Value.	Land.	Buildings.	Machinery.	Livestock.	Total Farm Produce.
Abitibi . .	3,313·00	1,554·00	853·00	519·00	397·00	785·00
Quebec Temiskaming	5,823·00	2,512·00	1,660·00	836·00	815·00	1,289·00
Cochrane-Hearst .	2,730·00	1,242·00	655·00	401·00	432·00	810·00
Ontario Temiskaming	4,769·00	2,255·00	1,171·00	667·00	676·00	1,012·00

TABLE II

Division.	Value per Farm, in Dollars, 1931.						
	Wheat.	Barley.	Oats.	All Other Grain.	Clover, Grass Seed.	Fodder, Roots.	Peas.
Abitibi . .	2·58	3·07	33·67	·80	3·07	269·21	2·24
Quebec Temiskaming	13·11	18·70	113·73	6·40	4·73	367·17	12·92
Cochrane-Hearst .	2·43	6·57	25·66	3·04	2·64	276·13	1·75
Ontario Temiskaming	11·40	13·30	52·31	3·50	14·15	345·61	4·43

TABLE III

Division.	Value per Farm, in Dollars, 1931.				
	Stock Sold from Farms.	Stock Slaughtered on Farms.	Poultry Slaughtered on Farms.	Animal Products.	Milk Produced.
Abitibi . .	19·37	44·67	6·68	152·05	115·13
Quebec Temiskaming	72·77	115·90	7·58	366·81	305·95
Cochrane-Hearst .	23·10	32·00	8·20	195·42	154·87
Ontario Temiskaming	55·90	70·30	12·90	262·90	194·41

TABLE IV

Division.	Percentage of Farms Reporting Forest Products.	Value per Farm reporting, in Dollars, 1931.		
		Pulp Wood Sold from Farms.	Wood Used on Farm.	Wood Sold from Farms.
Abitibi . .	70	173·40	89·12	234·15
Quebec Temiskaming	64	109·00	112·27	141·00
Cochrane-Hearst .	74	162·00	73·06	203·00
Ontario Temiskaming	53	104·00	73·68	179·00

NOTES AND BIBLIOGRAPHY

[1] For a more detailed account of the evolution of settlement see : Randall, J. R., "Settlement of the Great Clay Belt of Northern Ontario and Quebec," *Bull. of the Geographical Society of Philadelphia*, vol. 35, nos. 3 and 4, 1937, pp. 53-66.

[2] The total area is approximately 40,000 square miles.

[3] The population is divided as follows : 48 per cent. on farms ; 32 per cent. in organised agglomerated settlements ; and the remaining 20 per cent.—classed as rural non-farm—are located largely in small hamlets and unincorporated villages. Within the settled areas (Fig. 2) the density of population per square mile is as follows : Quebec Temiskaming area, 8·4 persons ; Ontario Temiskaming, 8·3 ; Abitibi, 4·3 ; and Cochrane-Hearst, 3·4.

[4] Climatic types by the Köppen classification : Dfb and Dfc.

[5] The word farmery is here used in its dictionary meaning to indicate the buildings, yards, and gardens of a farm. The term farmstead, commonly used in the above sense, is here used to mean not only the buildings and yards, but also all the land comprising the farm.

[6] The Ontario and Quebec Temiskaming areas are the oldest in years of settlement.

[7] The figures for population, crops, and livestock, unless otherwise noted, are taken from the *Seventh Census of Canada, 1931*, sections on Ontario and Quebec, Dominion Bureau of Statistics, 1935.

[8] Finch, V. C., and Trewartha, G. T., *Elements of Geography*, p. 229. Also see note 4.

[9] Sources of climatic data : Stupart, Sir Frederick, *Meteorological Tables*, Dominion Meteorological Service, 1922 ; Connor, A. J., *Meteorological Tables*, Department of Marine, Canada, 1931 ; personal interviews with the officials at the Amos, Quebec, Weather Bureau, and the Dominion Experimental Farm, Kapuskasing, Ontario.

[10] Officials of the Dominion Experimental Farm in the Clay Belt feel that the frost-free period will tend to increase with increased land clearing, and weather data to date seem to substantiate this premise. It seems best, however, neither to accept nor to discard this idea until a much longer weather record is available.

[11] The change from the inverted-V roof type of barn to the gambrel type also shows the beginning of a change in type of farming : from one of general or mixed farming to one with increasing importance in dairying.

[12] The chief coniferous species are black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) ; the chief hardwood species, aspen (*Populus tremuloides*) and white birch (*Betula alba* var. *papyrifera*).

[13] Quebec pays cash subsidies annually, and the total amount has been steadily increasing : in 1923 the total was $38,000 ; in 1927, approximately $200,000 ; and in 1935, $393,590. For the statistics for 1923 and 1927 the author is indebted to Mr. A. Belzile, Assistant Director, Dominion Experimental Farm, Kapuskasing, Ontario ; and for those of 1935 to Mr. Theo. Mercier, Chief of Land Branch, Ministry of Colonisation, Quebec.

[14] The population in the Clay Belt is restricted to those townships that have been surveyed and opened to settlement by the government, and generally new townships are not opened until older ones are fairly well taken up. Newly opened townships are supplied with roads before lots in them are sold to settlers.

[15] There are some 22 agglomerated settlements in the Clay Belt that range in population from 300 to slightly under 4000. Besides these there are a fairly large number of small settlements—classed as rural hamlets—that have from 25 to 100 or so inhabitants.

[16] Personal interviews with officials of the pulp plants.

[17] Both the Cobalt and Porcupine deposits were discovered during the building of the Temiskaming and Northern Ontario Railroad and its branches. This railroad was constructed largely with the purpose of opening the Clay Belt to agricultural settlement.

[18] *Seventh Census of Canada, 1931*, sections on Ontario and Quebec, Dominion Bureau of Statistics, 1935.

ECONOMIC PROSPECTS IN THE SOVIET-POLISH BORDERLANDS

A Review

Upon the advance of the Red Army to the River Bug in September 1939, we were reminded in broadcasts by Ministers of H.M. Government that by this action the Soviets had not merely saved eastern Poland from incorporation in the German Reich: they had established the "Curzon Line," proposed more than twenty years ago by the British Government on an ethnic basis,[1] and had united the sundered fragments of two peoples, the Byelo-Russians (White Russians) and Ukrainians. It is fitting, in these circumstances, that we should consider this region afresh. We shall ask, first, what the Soviets might do, given the problems which face this half-starved land and people newly included in the U.S.S.R. Secondly, we shall briefly consider what they are likely to attempt, in the light of their country's record of civil engineering and of agrarian and industrial development since 1921.

Two works have appeared recently which help us here.[2] Miss Doreen Warriner's *Economics of Peasant Farming* is based, in the first place, upon enquiries made among farm folk in every country of Eastern Europe—a living contact which appears not only from her sixty excellent photographs of farms, farm creatures and farm folk, but also from the directness of her writing. Added to this she has interpreted the statistics of European states with economic understanding and with geographical insight. The result is a most readable and reliable book, of absorbing interest to-day. The second work, prepared for the (deferred) European Conference on Rural Life, is documentation which almost inevitably lacks the human touch and in which, moreover, there is a certain lack of geographical grasp. Facts are too often given for a State (often, by now, in dissolution), not for the relevant belt of arid or of marshy land, of plain or of hill, to which they refer. It is documentation, nevertheless, which is important.

[1] Cf. Arnold Toynbee, *Nationality and the War* (1915), who on ethnic grounds proposed an eastern boundary for the Polish nation well to westward of the River Bug.

[2] Doreen Warriner, *Economics of Peasant Farming*. London: Humphrey Milford at the Oxford University Press, 1939. 12*s*. 6*d*.

Documentation for the European Conference on Rural Life, 1939. Rome: International Institute of Agriculture, 1939.

For photographic illustrations the reader cannot do better than consult Miss Louise A. Boyd's *Polish Countrysides*, Am. Geogr. Soc. Spec. Pub., No. 20, 1937.

The Marshes of the Pripet.—After speaking of the difficulties and of the purely relative prosperity of Central Poland, where at least the larger and medium-sized holdings give their farmers enough to eat, and where the division of property is much more equal than in either the long-prussianised west or in the east, Miss Warriner turns to the ill-drained basin of the Pripet, where there is still less prospect of improving the farming. Filled by sands poured out by the meltwaters of the Ice Age, for the most part below 500 feet in altitude although nearly a thousand miles from the Black Sea, half-barren sands stand high and dry above the level of the stagnant river with its peat bogs and marshes :

" The main problem is the improvement of the pastures which form about half of the total area and are at present mainly bog and marshland. Far-reaching schemes for improvement are necessary to drain the Pripet basin, but as this would involve co-operation with Russia it may be regarded as out of the question, since there is a tendency to regard the marshes as a natural frontier against Bolshevism. (In fact, this opinion is baseless, as the bulk of the population of these districts is Ruthenian, and antagonistic to the Polish Government ; its revolts have been subdued with great cruelty)."

Already, however, a Polish Farm Institute has shown that improvements could be made, by local drainage followed by treatment with kainite and phosphates cheaply obtained from the Dniester plateau. Local field drainage is possible with wooden pipes from timber cut in the vast adjoining forest of conifer and birch. This method has been applied with success in Scotland, for the peat prevents the wood from rotting for an indefinite period. But the problem of improvement is extraordinarily hard in view of the utter poverty. The sandy soils are not only infertile, but to produce crops need far more rain than that which falls in the shape of the brief, torrential summer storms which account for a large proportion of the yearly average of 22 inches. From Brest, at the new frontier, due eastward along the Bug-Pripet canal for a hundred and fifty miles to the frontier of 1921-39, one traverses a vast, predominantly forested zone of nearly constant width.

Of the Pripet marshland with Wolhynia, Miss Warriner writes :

" These regions cover two types of soil : the southern part of Wolhynia, adjoining the black earth region of Rumania and Russia, and a great area of sand extending north to Nowogrodek and south to Sarny, round the basin of the Pripet. Most of this land is either too wet or too dry for cultivation, and without drainage on a large scale cannot support its present population. Forty per cent. of the area is under marsh, forest and peat bogs. Most of the arable looks like pure sand. In these regions the peasants' life is a struggle for existence on a poor soil in a grim climate, with nothing to relieve its misery and its monotony. The villages are vast conglomerations of low wooden huts, with one room lit by a window a foot square ; the room contains little besides a stove and rough benches, covered with sheepskins which are crawling with lice. The level of cultivation is the lowest possible : so primitive that manure is spread on the fields by hand. The chief crops are rye, potatoes, followed by fallow. Of the farm land 60 per cent. is arable, 40 per cent. is poor pasture."

Although there is so little to live on, the density of population is as much as that of a well-tilled agricultural parish of the Lothians,

or what we should call a thin-to-medium rural density of 50-100 persons to the square mile. The land is over-populated, for much of the sand " should never have been tilled."

" Most of the forest land in these districts belongs to the big estates. The larger manor farms and the [smaller] estates seem to exist on the same level of technique as the peasants, and maintain a very low standard of living : old aristocratic families with names famous in European history live with less comfort than the poorest peasant in Germany. Bread is barely sufficient, and potatoes are also scanty. As members of the Orthodox Church, they keep fasts for twenty weeks in the year, eating only bread and fish oil."

To raise the standard of living of the present population alone will be hard, but to do so fast enough to catch up with the increase, which, in spite of the great mortality, is high, will be harder still. The essential remedy—that of drainage—is a long-term policy, even at the U.S.S.R.'s astonishing rate of achievement. Meantime

" No industrial products (except vodka) are bought. Linen is woven at home, shoes are plaited bark. Even matches are not bought ; flint and steel are used."

The problem, then, is one with that of the rest of White Russia and the somewhat similar sand-and-marsh lands elsewhere : drainage for the land, industrialisation of wood products from the forests, and lastly, the export of these. To aid the exportation by canal from the basin of the Upper Pripet and Bug, a project of modernisation was under consideration before the present war for the linkage of the canal system from the Pripet westwards by the Bug and Vistula to Germany, in a way more economic than before. The war, however, must delay this, perhaps indefinitely. Canal transport already exists, however, from the Pripet to the Niemen, and thence north-eastwards to (German) Memel and the Baltic States.

North-east Poland, its Hinterland and Outlet. — It is not the purpose of this article to weigh strategic moves against political rights, and it must suffice shortly to restate certain facts. The U.S.S.R. has broken down the anti-Bolshevik *cordon sanitaire* drawn round her famine-stricken people even before the last war had ended. The Soviet Government's insistence upon access to the Baltic for its millions has been backed by force, but while the Soviets are planting strategic bases upon Latvian and Esthonian soil (to prevent a recurrence of blockade), they have promised political independence. Their claim is that in establishing these bases, they are but defending not only their own people but also those of the Baltic fringe. Bearing Polish history in mind, the American geographer, Isaiah Bowman, wrote with foresight, " As Prussia advanced on the west Poland sought to advance eastward. It was a great and historic mistake and is one which Poland appears determined to repeat." [1] The grant of Vilna to Lithuania is noteworthy in contrast to Poland's ultimatum to that country last spring.

[1] I. Bowman, *The New World* (1924).

This leads us to note the new possibilities of exportation open to the whole of mid-eastern and north-eastern " Poland." Economic strangulation in these regions was induced by the Polish army's drive of 1921 along the parallel railway lines to Leningrad and northward, into a prolonged north-easterly salient or finger which in no sense constituted an economic "corridor." Henceforward,

Approximate Distribution of Forest (in Poland based on Dierke's *Schulatlas* and in Russia on the *Great Soviet Atlas*, vol. 1). The concentration in the Pripet basin west of the old Soviet-Polish frontier (shown as a plain line) is noticeable.

for so long as the Russo-German alliance endures, the Niemen (Memel) river can be used with its tributaries, through Grodno or Vilna to Memel, or to Libau in Latvia. The direct outlet thus reopened through the Baltic States (or East Prussia) to the sea should prove valuable to all the peoples of the former Czarist empire. Lithuania should now be able once more to profit by its

geographical position to export and in part to manufacture the raw materials of its Soviet hinterland; and this gate being opened anew, the hinterland—including what was for a time north-eastern Poland—should profit in its turn.

The Polish Ukraine (*Eastern Galicia*).[1]—One of the most extraordinary misrepresentations of the Hitlerist régime has been its periodic outbursts about the cornlands of the Ukraine. Corn there is, but let us hear first whether there is corn and to spare. The region of Galicia, including Polish Ukraine, enjoys

"better natural conditions than the rest of Poland; much of it is the good Carpathian loam, and the climate is wetter. Here the farming system is more intensive, the livestock density is higher, about 45 cattle to 100 hectares; the crop system is good in that rotations are known and practised. But yields are lower, amounting to 9 quintals as compared with 12 in Central Poland, and are falling."

The rotation in use, however, shows signs of population pressure, the soil being used three years in succession for grain without adequate manuring.

"A sign of the shortage of green fodder is the very general practice of sowing two crops in one year, either a corn crop which is cut green in May, or lupines, which are cut and followed by potatoes and turnips."

Whereas in the Pripet marshland and much of White Russia the people are backward,

"in many districts [of Galicia] milk marketing is well organised on a co-operative basis. The average yield of the cows in the best villages is 1200 litres per year, a good level. Special banks for savings exist in connexion with the co-operative marketing societies: the co-operatives are on a sound financial basis and even in the depression have built mills and dairies out of their profits. On the initiative of Professor Wodek of Krakow, a movement has begun to form co-operatives to control the pastures, limiting the right to pasture cattle, and requiring a rent in liquid manure for each animal pastured.

"The conditions described are those of the best villages in Galicia, where there is no actual bread shortage before the harvest. But the standard of living may be judged by the fact that only half of the families can afford to eat their own pig. In the districts farther from the main lines of communication the price of milk is lower and crop yields are poorer."

Here it is not lack of technical skill, nor excessive fragmentation (though this is present), but too intensive corn cropping, which is the cause of declining yields. Yet the pressure of population makes obligatory this amount of corn.

"In Galicia over-population assumes extraordinary dimensions; the problem is specially acute because it is of long standing. The economic conditions of the province are probably the worst in Europe, if we consider the extent of destitution, which seems to affect the peasantry as a whole and not merely the poorest class. The biological effects of over-population are now being felt by the second or third generations. Almost every family has a cripple; rickets and tuberculosis are prevalent. Farther to the east in the Ruthene territories conditions are still worse."

[1] See also "Documentation," pp. 40-41.

Conclusion: Collectivisation and Industrialisation.—To what she describes as " the German solution," which the reader can readily study with her help, Miss Warriner compares the Russian solutions, of collectivisation and industrialisation. The analysis in her concluding chapter is admirable in its objectivity, and shows appreciation of the geographical differences between collectivisation as imposed in the long-settled and over-populated tracts resembling eastern " Poland," and that introduced in the open, dry, south-eastern steppes, hitherto uncultivated for want of capital but now made available by collective colonisation. The immediate and disastrous results of collectivisation in other parts of Russia, where a reluctant peasantry burned their crops and slaughtered half their beasts with resultant famine, could have been avoided.

" As proof of this it is only necessary to refer to Louis Fischer's description of the brilliant results of collectivisation in the small [sub-Caucasian] republic of Kabardo-Balkaria, where the wisdom of Kalmikov allowed peasants to keep their beasts on joining the collective. Had this course been followed in general, the disastrous decapitalisation would not have taken place, and production might have been maintained."

Whereas Imperial Germany had developed both industry and agriculture in western Poland, and such development of textiles as had been undertaken under Czarism was also started—often by Germanic *entrepreneurs*—far west of the Bug, the U.S.S.R. in its new territory will have to start almost from the beginning; for the Polish Government, while maintaining industry in the west, had endeavoured to concentrate it in the south-centre,[1] and had done almost nothing in the east. The lack of power and of readily exportable raw materials remains the fundamental problem. Even the output of petroleum from " Polish " Ukraine is not what it was. But, small though the proportion of skilled workmen and technicians is, they form at least a nucleus Moreover, to nationals repatriated from western Poland must be added the skilled refugee element, which, however, in itself presents a problem of morale and adds to the already crushing burden of the Soviet poverty problem. On the whole, one's hope is that lighter industries may be developed in relation to the growing Russian market, and ultimately that the export of timber and its products to the West may be undertaken. Now that the poverty-stricken eastern fringes of Poland have been attached to the Soviet Union, there is ground for the hope that their people may share in such eastward colonisation as is still possible on the borders of the steppes and the north-eastern forests, and in the exploitation of Russia's coal and minerals, both the potentials of new industry.

ARTHUR GEDDES.

[1] W. J. Rose, *Poland* (Penguin Special), map, p. 151.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

Meeting of Council, November 28th, 1939

Election of New Members.—Twenty-one ladies and gentlemen were elected members of the Society.

Presentations to the Library.—The following donors were heartily thanked for presentations to the Society: Mr. John Bartholomew, Dr. Douglas Guthrie, Mr. A. A. Pinkerton, Miss R. M. Raeburn, and Mr. J. W. Moir.

The late Mr. F. L. M. Moir, J.P.—Mr. Moir, a former member of Council and chairman of the Glasgow Branch, died on November 2nd, 1939, at the age of 87. Mr. Moir maintained to the end his interest in the African Lakes Corporation Ltd., East African merchants, shipowners and planters, of which he was chairman.

The son of an Edinburgh physician, Mr. Moir was educated at Edinburgh University and on the Continent.

In response to Livingstone's appeal to Britain to assist in putting down the drink trade and slave traffic, a party of six led by Mr. Moir and his brother Mr. John W. Moir landed in East Africa in 1878. The company succeeded in getting the drink trade with the natives prohibited by international agreement in 1885, and after twelve years of unceasing effort the slave trade in that region was also brought to an end.

Mr. Moir carried the benefits of commerce in the tracks of David Livingstone and did much to establish British interests in Nyasaland.

The Council desired to express sympathy with his daughter, Mrs. Archibald Kay, and his brother, Mr. J. W. Moir, in their bereavement, and instructed the Secretary to send them a copy of this Minute.

The late Mr. James H. Horsburgh, M.B., C.M., B.Sc.—A former member of Council and for many years a valued member of the Society, Dr. Horsburgh died on November 2nd, 1939, at the age of 77. He had been a medical practitioner in Musselburgh for fifty years, during forty of which he held the appointment of Medical Officer of Health. An Edinburgh graduate, he set a high standard in his profession, and his scientific bent brought him into touch with this Society. Like his brother, the late Mr. Ellice M. Horsburgh who contributed to *The Scottish Geographical Magazine*, he was interested in nautical charts and navigational geography. His generous sympathies, his unfailing courtesy, and the honesty and modesty of his personality will long be remembered.

The Council expressed the deepest sympathy with his widow, and instructed the Secretary to send her a copy of this Minute.

Lecture Session, 1939-1940.—The following Afternoon Lectures were delivered in the Society's Rooms in Edinburgh: November 8th: Miss Ida M. Hayward, F.L.S.—"African Voyage"; November 22nd: Miss Amy J. Atkinson—"Rome Yesterday and Rome To-day"; December 6th: Miss Ella Christie, F.R.S.G.S.—"A Summer in Baltistan"; December 20th: the Rev. T. Torrance, F.R.G.S.—"The Emigration of the Jews: Israel in the Far East." The following Afternoon Lectures were delivered in the Lyric Theatre, Glasgow: November 18th: Sir Ian Bolton, Bart., D.L.—"Big Game in the Kruger National Park, South Africa"; December 16th: the Rev. W. Neil Sutherland, M.C., M.A.—"Palestine." All the Lectures were illustrated.

REVIEWS OF BOOKS

EUROPE

The Future of Scotland. By James A. Bowie, M.A., D.Litt. London and Edinburgh : W. and R. Chambers, Ltd., 1939. *Price 7s. 6d.*

Suffering under a low birth-rate (p. 36), an ageing population (p. 35), and a creeping paralysis of depopulation (p. 55), and exhibiting symptoms of gross social and economic maladjustment in persistent unemployment (p. 103), Scotland must at once take stock of her possibilities. To the question " Stands Scotland where it did ? " the Principal of Dundee School of Economics and Commerce would at least shake his head thoughtfully. " The problem," he writes (p. 220), " is one of threatened decadence "—in population, education, industry and commerce—and, after examining it fully, he offers definite guidance towards a solution.

Dr. Bowie's examination of present-day conditions in Scotland, fully documented with the most recent official Reports, is written with courageous frankness and unconventional freshness. Here is an excellent text-book for a W.E.A. or private study-group, an admirable weapon for the Scottish Nationalist, and an arresting account of Scotland's present position for the student of political economy, the business man, and every patriotic Scot. J. H. B.

Hebridean Journey. By Halliday Sutherland. London : Geoffrey Bles Ltd., 1939. *Price 10s. 6d.*

The reader seems to be rather long on the journey, five chapters being recorded before he finds himself in Oban Bay, but Dr. Sutherland meets so many interesting circumstances and is so good a conversationalist that the reader gets over this with pleasure.

The author attempts no systematic, historical, or scientific survey of the islands. He wanders over the Outer Isles and talks about fairies and second sight. He writes of St. Columba and the legends of his time. He recrosses the Minch to visit Rhum and Canna (which he writes Rum and Cana), Coll and Tiree, and Eigg (without mentioning the massacre in the great cave), where he visits the " singing sands " and declares that the only other place of which he has heard where similar sands exist is in Massachusetts. There are books in the Society's library which refer in some detail to such sands in Southern Arabia and North Africa. Skerryvore he states to be inhabited by " sea rats." The reef upon which the lighthouse stands is submerged at high tide and we cannot imagine what the creatures are to which he refers.

As the book gets to within four chapters of the end, the author embarks in one of the Fishery Board's cruisers, *Rona*, one of the new boats on police duty. By an unfortunate slip the cruiser *Minna* (there was also a *Brenda* and a *Freya*) is called *Minnow*. The Fishery Board don't quite come down to minnows. Incidentally, the author seems to accept the view that trawling destroys immense quantities of fish spawn, and we would respectfully remind him that the eggs of most fish, and even of flat fish which live on the bottom, are pelagic and float freely near the surface. These last chapters are splendid reading, however, and the story told by a Naval officer who was in command of H.M.S. *Champagne* is an epic of the last war which should not be missed. W. L. C.

The Islands of Scotland. By Hugh MacDiarmid. London : B. T. Batsford Ltd., 1939. *Price 10s. 6d.*

To those desiring photographic illustrations of life and scenery in the islands, this book may confidently be recommended ; but the economic arguments in the text must be treated with extreme caution, as the writer has fallen too deeply under the spell of the Isles. Even a writer of the high literary repute of Mr.

Hugh MacDiarmid must, when he publishes a volume on the present state of the Islands of Scotland, expect that his work will be reviewed in a journal of this kind not on its style but on its contents, from which the personality of the author and his frequent and irrelevant quotations from his own and others' writings are apt to distract attention.

Although this volume, by a Borderer resident in the Shetland Islands (please not " Shetlands," which is an artificial title), is extremely well illustrated, there is no apparent connection between the illustrations and the text. Secondly, the author, despite his Whalsay home, reveals no friendship with the islanders and shows no intimate knowledge of any other part of the archipelago. He quotes, for instance, from Hibbert's description of the Holes of Scraada in 1822 without mentioning that the bridge has now gone. He prints, without comment and at length, a reputed account by Ernst Carl—accepted as authentic by the *Völkischer Beobachter*—of two Irishmen who placed time bombs on board the *Hampshire* and watched her blow up from a hotel in Kirkwall. Actually the vessel sank off Marwick Head, which cannot be seen across Kirkwall Bay. The arguments for the social and economic rehabilitation of the island groups are optimistic, and the author suggests that perhaps the Shetlanders may do as did the Faroese and take into their own hands the white fishery. How much of Shetland waters have a rocky bottom to prevent trawling? A. C. O.

To Introduce the Orkneys and Shetlands. By IAIN F. ANDERSON. London : James Clarke and Co. Ltd., 1939. *Price 7s. 6d.*

This volume, essentially a first impression, may interest the casual reader, though the treatment throughout is superficial and the conversational style of the author will irritate many. Frequent praise of the steamships used—praise which the reviewer cannot always endorse—would almost seem to imply that the steamship companies had been interested in its publication ! As the writer spent apparently only a few days ashore, errors of statement are understandable, but surely " Featherland " for Feideland is more than a misprint and could have been avoided by a simple map study. A. C. O.

My Kingdom for a Horse. By MARGARET LEIGH. London : Macmillan and Co. Ltd., 1939. *Price 7s. 6d.*

This is the diary of a ride from Cornwall to the Scottish Border which took place in September 1938. Miss Leigh, who had a companion as far as Hartington in Derbyshire, carried equipment on a pack-horse and camped in the open so long as the season and the terrain were not unsuitable. One fact which emerges very plainly is the difficulty of obtaining oats or grazing for horses nowadays. Miss Leigh has had practical experience of farming and comments with a knowledgeable pen on anything she sees that bears witness to the slow change in farming systems from south to north. The month's journey was uneventful by explorers' standards, and the story is told with an unassuming intimacy and simplicity of diction that make it very easy to read. The book does not convey a great deal of information, but the intangibles of the English countryside, unconfused by sentimentality, illuminate and give homogeneity to the simple narrative.

North Cape. By F. D. OMMANNEY. London : Longmans, Green and Co. Ltd., 1939. *Price 10s. 6d.*

The author, formerly of *Discovery II*, signed on as a deck hand aboard a deep-sea trawler, *Lincoln Star*, out of Grimsby and bound for the fishing grounds off Iceland. This is in no way a scientific study of the distribution of fish and the methods of catching them, but rather a study of men—their work, language, habits and interests. Doubtless it was difficult for the author to break through the reserve of the fishermen, but he managed to do so and his graphic descriptions of life and work aboard ship with glimpses of the fleeting visits to what may be called " home " in Grimsby make interesting reading. J. Y. E.

The Land of France. By Ralph Dutton and Lord Holden. London : B. T. Batsford Ltd., 1939. *Price* 8*s.* 6*d.*

France is a superb holiday country. It isn't far, it isn't dear, and it is infinite in variety. Here is a book to convince you of it, if you did not know before. You probably did. If so, the book's chief value is that it lays the whole country before you, dealing briefly with the better known parts and filling in the blanks ; telling you by no means all you will want to know about each individual district, but supplying you with sufficient information to make an intelligent choice. Naturally it is not light reading. The information is too packed for that. It is a reference book, for planning a new holiday and reliving the last, a running commentary, as it were, upon the map of France. The photographs are all that anybody could desire. Whether they illustrate an aspect of French life or of French landscape, they are equally and exquisitely apt. C. L.

Greek Earth. By Sidney W. Hopper. London : Michael Joseph Ltd., 1939. *Price* 12*s.* 6*d.*

To lovers of Greece—and how numerous they are—this book will bring welcome refreshment. It is divided into three unequal parts, namely, Athenian perambulation, Attic amble, and Aiolian ways. The writer travelled on foot, which is the best way of exploring Greece, and of course he saw much more than the casual tourist. He does not, like some writers on Greece, concentrate on the relics of the past. To them he accords ample space, but he acknowledges that modern Greece is not without interest and that it is by no means as degenerate a country as some suppose. There is no map to guide the reader whose acquaintance with Greece is slight, but the book is illustrated by sixteen excellent photographs. Although the literature on Greece is already enormous, the work of appraising ancient and modern aspects each at its true value has seldom been better accomplished. D. G.

The Mirrors of Versailles. By Elisabeth Kyle. London : Constable and Co. Ltd., 1939. *Price* 10*s.*

The problems of Central Europe are very complex and it is sad to think of the numbers of people forced to live outside the frontiers of their choice. The Czechs as a race seem to be unpopular. The excuse for them that the flower of their manhood was destroyed by the Hungarians and the Austrians at the Battle of the White Mountain seems a poor one : after all, we had our Flodden. But outside the Hungarian frontier we find children being taught the Hungarian National Anthem ; in Roumania we find German children being forced to learn Roumanian ; in Bosnia, " a few remnants of the Ottoman Empire still existing, forgotten and unchanged " ; in Bohemia were Sudeten Germans scorning the Czech community in which they lived. And Latvia, free for the first time since the year 1200 :—what separate culture can she have ? asks a Baltic Baron.

This is a light, pleasant, easily read book, describing a round of visits paid in the summer and autumn of 1938. Indeed, its only fault is that it is too superficial ; so many topics of absorbing interest are merely mentioned. Some of the articles are reprinted from *The Glasgow Herald*, *The Manchester Guardian* and *The Bystander*. There is a clear end-paper map. H. C. H.

Towns and People of Modern Poland. By Robert McBride. London : Jarrolds Ltd., 1939. *Price* 10*s.* 6*d.*

This is hardly what it claims to be, " an up-to-date study " of the country and its people. The author made a rapid trip through a part of Poland, landing at Gdynia and paying short visits to Warsaw, Cracow, Poznán and one or two other cities, and to the Pripet Marshes.

It is a matter of regret that Mr. McBride had not more time at his disposal, and that he has not been able to give his readers a real study of the country

and people. The subject has now an absorbing if melancholy interest. Poland has again been crushed and partitioned, but no one can doubt she will again rise and come into her own. The sympathies of this country are with her, and every book which adds to our knowledge should be welcome, so that this author's contribution is opportune, and may be recommended. S.

ASIA

Minaret and Pipe-Line: Yesterday and To-day in the Near East. By MARGRET BOVERI. Translated by L. M. SIEVEKING. London: Humphrey Milford at the Oxford University Press, 1939. *Price 21s.*

Dr. Boveri has written another volume equal in interest and learning to her *Mediterranean Cross-Currents*. Her wide knowledge of European affairs is universally recognised and her authority unquestioned. She has recently made an extensive tour in Turkey, Iran, Iraq, Syria and neighbouring states, so that her new book which deals with these countries is the result of first-hand knowledge. In its opening pages she gives a historical sketch from the earliest times of the Near East, an intelligent understanding of which in this country may at any time become of the first importance. Dr. Boveri supplies the material for such an understanding from every point of view. Although the distinguished correspondent of a leading German newspaper, she is completely impartial, and especially gives to Britain ungrudging credit for the great work that has been done, notably in Iraq. The book is a work of reference of very great value. The literary style is excellent, as is the translation from the German by Miss Sieveking. S.

Settlements in the Lower Indus Basin (*Sind*), Parts I and II; and *Sind's Changing Map*. By Professor M. B. PITHAWALLA. Karachi: The author. *Prices Rs.* 5 and *Rs.* 2 respectively.

With this and other papers Professor Pithawalla concludes his series of studies on Sind. These studies show careful compilation from the existing bibliography, including old maps, and also a constructive outlook based upon engineering knowledge; they include an excellent population map on Sten de Geer's method.

Hitherto most of our studies of river changes and of the resulting changes in cultivation, routes and settlements in the alluvial plains of India have come from administrative officers, usually those working on detailed surveys of land assessment. Although beginning as amateurs, without the theoretical understanding of physiography of either the hydraulic engineer or the modern physical geographer, these men acquired real knowledge of the country by covering the ground and by close questioning of the peasants. This knowledge the academic geographer cannot attain, even if he is a resident in the country with wide experience of field study elsewhere, without intensive travel and the possession of good eyes, stout legs and a still stouter heart! Field observation illuminates the data of the excellent large-scale topographical maps now appearing in Sind, and we could wish that the author had conveyed to his readers the illumination of such personal field study. He reports no observations of his own on the long-abandoned "desert" river lying east of the modern Indus, the Ghaggar-Hakra—E. Nara. The reviewer, when crossing the Ghaggar by air, was able to take one or two photographs which are eloquent of the Ghaggar being a small stream meandering in the bed of a once larger river, "a misfit." Thus it appears to him that a few flights and journeys along this river with a camera and topographical maps should be most revealing to one with Professor Pithawalla's wide knowledge of the literature of his subject. Flying men are thoroughly awake to the interests of archaeology—of all academic subjects the least likely, one would have thought, to interest modern mechanicians or sportsmen!—and if antiquarians have succeeded in Britain, cannot Indian geographers enlist the services of Indian aeronauts on the vital problems of yesterday, to-day and to-morrow in their own province and land? A. G.

Peaks and Lamas. By Marco Pallis. London : Cassell and Co. Ltd., 1939. *Price* 18*s.*

We have to acknowledge considerable difficulty in giving anything like an adequate review of this book, which must contain quite 150,000 words and which calls for careful thought and reading. It has a measure of geographical interest, but this is really secondary to the main theme. Two major mountain expeditions are described, each of which has a route map clearly outlined, which, apart from the confusion arising from their somewhat archaic spelling, indicate the lines of attack far up in the chain of the Himalaya. The first expedition was among the headwaters of the Ganges near the watershed of the Sutlej, where " Riwo Pargyul " was climbed. The second followed the caravan route from Kalimpong to Tibet up the Tista River so as to attempt " Simvu," which is to the east of Kinchinjunga. This expedition had to turn back from an inaccessible point near the summit. The third followed a route from Srinagar in Kashmir over the Zoji La by Kargil into Ladak.

It is here that the chief theme of the book is developed. Quite two-thirds of the volume are given to what might be described as a carefully studied apologia for Tibetan Buddhism as seen by a sympathetic observer who has set himself to understand the mysteries of the *Tantras* and the Round of Experience, and who interprets them after Madame David rather than after Colonel Waddell. We congratulate Mr. Pallis on his patient examination and searching into the inwardness of this composite religion, which calls for such extreme observance of its laws, and which yet—on the Chinese border at least—has apparently done little for the uplift of the common people. We must however shelter behind Dr. Johnson's plea of " sheer ignorance " rather than express a lay opinion on a system that remains so intricate even after Mr. Pallis's clear exposition.

The book is profusely illustrated with excellent photographs, and will, without doubt, secure a place in the rapidly increasing descriptive literature of Central Asia and its inhabitants. G.-B.

Eastern Journey. By J. H. MacCullum Scott. London : The Travel Book Club, 1939. *Price* 3*s.* 6*d.*

A smoothly written and easily read account of a tour through Malaya and India, with descriptions of scenes, sights and sounds already familiar to all who read travel books. The descriptions are moderately good, though I fancied I detected something of a would-be detached air of superiority in the atmosphere of the book. Probably this was not meant ; very likely it is not so at all ; but the impression persists.

The book takes one into no really out-of-the-way places, but makes a good adjunct to the guide-books, as it contains many sidelights not found in official publications. T. R.

The Naked Nagas. By C. von Fürer-Haimendorf. London : Methuen and Co. Ltd., 1939. *Price* 15*s.*

The Nagas are savage slave-raiding head hunters who live in the hill country on the Assam-Burma frontier. Their unpleasant attributes have repelled visitors, and little has been known about them till the author recently made a stay of some duration among them for the purpose of study. He is an anthropologist of note, and his book is mostly written from that standpoint, and gives a meticulous description of the daily life and surroundings of the people. He is an inveterate and skilful photographer, and the result is that the illustrations are both numerous and excellent. S.

Karakoro: At Home in Japan. By Henry Noël. Tokyo : The Hokuseido Press, 1939. *Price* 6*s.* 6*d.*

Printed and published in Japan, this book does credit to the Japanese press alike with regard to text and—as may be expected from an artistic people—illustrations. The author has much to tell which should be of interest to the

general reader, although his theme is a well-worn one. He devotes a chapter to his ascent of Fujiyama, the famous mountain of Japan, which he heads "On Fuji all men are brothers." It appears that there exists an Association of Climbers of Mount Fuji, of which one can remain a member only on condition that one climbs the mountain every year. Yet there are many members of a ripe old age. Fuji, it may be mentioned, is not a very formidable mountain, the height being about 12,000 feet. Mr. Noël quotes a Japanese proverb to the effect that "there are two kind of fools: those who have never climbed Fuji and those who have climbed it twice."

Mr. Noël has an interesting chapter on Kyoto and the Inner Shrine of Ise with its well-known bridge which is so often pictured in Japanese embroideries. We can recommend his book to readers who are interested in Japan and its people.

J. D. M.

I went to the Soviet Arctic. By RUTH GRUBER. London: Victor Gollancz Ltd., 1939. *Price* 10*s.* 6*d.*

Dr. Gruber is a young American journalist who was sent to Siberia by a great American newspaper to investigate the position of women. She had the advantage of securing the interest of the famous Professor Schmidt, the Head of the Northern Sea Route Administration, after which her path was easy. She shortly describes her visits to Leningrad and Moscow, and then the flight by plane to Igarka. There she remained for a considerable time, making the discovery that women have exactly the same status in life as men, as captains of ships, scientists and engineers. One may be forgiven for feeling that, after all, Miss Gruber was "only shown what she was meant to see."

The author finished up with a voyage along the Arctic coast of Siberia and Russia from Igarka to Murmansk, and it is almost amusing now to read her descriptions of the immensely strong fortifications and naval bases, all openly designed with a view to the coming war with Germany.

S.

AFRICA

Afrique Équatoriale, Orientale et Australe (Géographie Universelle, vol. XII). By FERNAND MAURETTE. Paris: Librairie Armand Colin, 1938. *Price*, 150 *francs.*

The partition of Africa, which took place with geometrical ruthlessness before the end of last century, left an inheritance of natural frontiers transgressed from which the integral outline of the geography of that continent has been slow to emerge. The history of human progress within the two parts of a politically divided area of natural unity may have been so different as to justify our regarding its subdivision henceforth as an established geographical fact. Add to this the differences in what constitutes knowledge and in our ways of recording it on either side of administrative boundaries, and it becomes obvious that the material for a balanced survey, region by region, of such parts of the continent as M. Bernard has omitted from his two volumes in the same series, is incompletely accessible, if indeed it exists in uniform quantity and quality at all. This volume includes "Equatorial Africa" (the Belgian Congo and French Equatorial Africa, without northern Angola), "East Africa" (the fractured plateau of the Great Lakes and its littoral), "North-east Africa" (the "horn" and Ethiopia before the Italian invasion), "The Nile" (with Suez), "South Africa" (which in Northern Rhodesia approaches within ten degrees of the Equator), and Madagascar with associated islands.

The attempt to focus so much, commendable as it is in the absence of precedent, has led to a lack of definition and a haziness of detail (upon which the reader will do well to seek corroborative evidence). While the exact height of a mountain or position of a boundary between one British colony and another is of no great consequence, there are some extraordinary omissions (the Etosha Pan, for instance, is not included in the area having inland drainage) and confusions

(the " monsoonal " rainfall of Cape Province is the more surprising in that data are more complete for the Union than for any other part of the continent, with the possible exceptions of Egypt and Madagascar). That this compilation is a library study would not have detracted from its value had not the library been neither comprehensive nor particularly up-to-date. While his descriptions are not wanting in picturesque or striking expressions (" *l'Afrique australe . . . qu'unissait seul au reste du vieux monde l'isthme large, solide, sec et nu des hauts plateaux d'Afrique orientale* " evokes a sufficiently memorable picture of the environment of the centuries-old human penetration from the north-east), M. Maurette is on the whole less happy in his treatment of the physical than of the human background. The illustrations, both photographic and diagrammatic, are of the high standard associated with the series, and although the volume cannot be recommended unconditionally as the classic on its subject, it is nevertheless a stimulating and noteworthy contribution.

Ethiopia: An Empire in the Making. By Ferdinando Quaranta. London : P. S. King and Son Ltd., 1939. *Price* 7*s.* 6*d.*

The purport of this book is to place before English readers—for whom the author has a warm regard—a straightforward account of the colonial and economic development of Abyssinia since the Italian war. The book is largely based on knowledge acquired during the course of official work in Abyssinia and in the Study Section of the Ministry of Italian Africa, and although the author disclaims for it any official endorsement, his information is as nearly official as can be.

There is nothing political, and little of reference to the natives or any policy affecting them. It is too soon yet to assess results, but the book impresses one with the thoroughness of the programmes outlined and the generous financial help that is being extended to the new Colony by the Italian Government ; as an experiment in colonial development it will be watched with interest.

With Roman foresight the largest expenditure (£33,000,000) has been on roads, and already some 2770 miles have been built, metalled and tar-treated at an average cost of £12,000 per mile ; maritime construction follows closely in cost, and large sums have been voted for white settlement, medical services, public building, electric and mining undertakings, and other necessary services. The white settlement, which is not being unduly hurried but carefully prepared for, gives opportunity for all types, from the peasant who is state-helped to the more ambitious limited companies whose aim is the extensive development of mineral resources under state co-operative control.

The book is what it is intended to be—informative—and leaves us with the conviction that had our British dependencies in Africa received from our Government the same interest and financial support, our success might have been greater than it is. J. R.

By Bus to the Sahara. By Gordon West. London : The Travel Book Club, 1939. *Price* 3*s.* 6*d.*

This is a lightly written and bright account of a journey round the interior of French Morocco, which, as indicated on a sketch-map, covered some 1600 kilometres and was undertaken chiefly in conveyances which require to be imagined as well as described. The author and his wife eventually entered the Sahara at Tsar-es-souk, a point west of the " Grande " Atlas on a line between Mogador and Figig, but did not remain there for any length of time. The book is written on a pronouncedly personal note and is full of anecdotes of experiences among Arabs and Berbers as well as of the life of the Foreign Legion at their outposts. G.-B.

Dark Subjects : Twenty-four Adventurous Years in Nigeria. By H. L. Ward Price. London : Jarrolds Ltd., 1939. *Price* 15*s.*

This is an account of the author's twenty-four years in Nigeria in various posts from Assistant District Officer to Resident. As a record of West Africa it is out-

standing, and among books of its kind it is one of the best. Mr. Ward Price has a more intimate knowledge of his " Dark Subjects " and a greater understanding of and sympathy with them than is usual in the case of Government officials on " The Coast." Particularly does he understand the powerful Yoruba peoples. No other book we have read affords the reader so deep an insight into the minds of the negroes, and none is so sensible in the outlook of the white man, whose job should be to teach them to govern themselves.

Although conveying so much solid information the book is entertaining, and the accomplished literary style is not to be wondered at considering the name of the author. We strongly advise readers, whether interested or not in negroes, West Africa, and their problems, to read this most fascinating book. S.

AMERICA

Journey to the World's End. By HAKON MIELCHE. Edinburgh and London : William Hodge and Co. Ltd., 1939. *Price* 12*s.* 6*d.*

The world's end of this book is Tierra del Fuego, a bleak, stormy and unfriendly land to lure two adventurous spirits whose aim was solely " to go places " and see new sights. Mr. Mielche's last journey was across the wide sunlit waters of the Pacific, and was described in *Let's See if the World is Round.* The present book follows comparable lines in its bright and entertaining style, its vividness of word, and its delightful marginal sketches. Perhaps it is the better of the two, for it tells of places of which little is written—the frontier town of Magallanes (Punta Arenas), the coal mines of Mina Elena, the sheep ranches and ranchers of Patagonia and Fuegia, the Ona and the Yaghan Indians, the convicts of Ushuaia, and the lonely seal hunters of Beagle Channel and the islands around the Horn. There is a great deal of geographical value, for those who want that sort of thing, purveyed in a style that is never dull or commonplace. Like the earlier volume it is well translated from the original Danish and can be strongly recommended. R. N. R. B.

AUSTRALIA

A Voyage to New Holland. By WILLIAM DAMPIER. Edited, with Introduction, Notes and Illustrative Documents, by JAMES A. WILLIAMSON, D.Litt. London : The Argonaut Press, 1939. *Price* 12*s.* 6*d.*

This exceedingly well produced book completes the Argonaut Press edition of Dampier, and is a reprint of that explorer's last book. Dr. Williamson says truly that, although the west coast of Australia then known mostly to the Dutch was visited at a few points, and Sharks Bay explored, instead of *A Voyage to New Holland* the book might more aptly have been called " A Voyage to New Britain." In 1699, the east coast was the main object. When, however, Dampier had visited Timor and sailed along the north coast of New Guinea, he decided that his ship was not fit to make the extended voyage, and he turned for home. The *Roebuck* was eventually abandoned, full of water to the hatches, after having been run aground on the island of Ascension. Efforts to stop a serious leak made matters worse, owing to the rottenness of the timbers.

The account of the voyage given in the Introduction, the estimate of the explorer's character, and the circumstances under which the expedition was carried out, form delightful reading. There is an interesting frontispiece, from the painting of Dampier by T. Murray in the National Portrait Gallery. The book is an admirable finish to the edition. W. L. C.

Australian Journey. By PAUL MCGUIRE. London : William Heinemann Ltd., 1939. *Price* 12*s.* 6*d.*

Amongst sound and useful books on Australia, this volume will take a high place. It is by a native of South Australia, who not only knows his own country but who has travelled widely and has adequate standards of comparison. It is not primarily a travel book, but a comprehensive treatise on the history and

development of the country, the changes which are in progress and which, in not a few cases, menace the country's future, of mistakes paid for and triumphs attained.

There is already a standard work on *The Discovery of Australia* (G. Arnold Wood), so we have only a digest of history in this volume, but a most useful and concise digest. Quite early the author deals with the strategic position of Australia in the Pacific. But what may be termed the external political aspect soon gives place to a consideration of the many problems which beset New South Wales, Victoria, Queensland, South and West Australia at home. He tells exactly what sort of country exists in some of the localities which have been spoken of as areas for mass settlement, in, for instance, the Kimberleys, where in his opinion any attempt of the kind would end in disaster. That the country needs people we all know. The drift to the cities is growing more and more marked, and Sydney is now the second largest in the Empire. But the city-dweller is a type distinct from that found elsewhere, especially in the tropical parts of Queensland, where already the birth-rate is higher than in any other State, and where a tall, lean, wiry type of man grows.

A marked feature is the emphasis laid on the protection of the land surface from the influences of rain and wind. The common practice of ring-barking the eucalypts and clearing the ground for grain crops and for pasture is repeatedly condemned. The geology of central Australia is not only of great interest, but of vital importance to the country's future. There is no need to increase the menace by the diligent action of man in wrong directions.

It seems to us most satisfactory that Mr. McGuire leans to the importation of non-British labour for the cane cutting. The alternative is an ever-rising State subsidy, for Australian wages at this work are from £6 to £10 a week and the industry has to compete against foreign sugar worked by coloured labour. We note that individual enterprise is apt to be snuffed out if it competes with State business interests. In may cases, such as the splendid facilities of an inexpensive waterway in the Murray River, which is reported as navigable for the best part of 3000 miles, a valuable national asset has been set aside. State railways get the haulage over steep gradients. In the same way, bus traffic which competes with State railways, although of infinite convenience to the public, has been ruthlessly put down.

There are some splendid illustrations, and quotations and verses which no doubt lighten the letterpress but in few cases add value to the book. We have not seen many Backblock ballads, but the Australian type inclines to be coarse without being poetical. W. L. C.

POLAR REGIONS

Polar Exploration (" Epics of the Twentieth Century "). By Andrew Croft. London : A. and C. Black Ltd., 1939. *Price 7s. 6d.*

A series entitled " Epics of the Twentieth Century " calls for only a brief introduction on earlier polar expeditions and it is not until recent work is reached that Mr. Croft gets into his stride. He writes well and gives his facts with accuracy, and if he is clearly influenced by the publicity aspects of this or that expedition he may be excused on the score that this is a book clearly designed for a popular market. But this lack of balance is notable and detracts from the book as a serious contribution to polar work. Expeditions whose work is well known through many publications receive long notice : others of equal merit but less popular acclaim are scarcely mentioned. Recent Oxford or Cambridge expeditions, many of great value, loom large : such excellent work as that of the Danes in Greenland or the Norwegians in Spitsbergen is almost overlooked. Wegener's expedition to Greenland is relegated to a footnote ; while Lindsay's traverse, undeniably a fine piece of work, receives many pages though it had little exploratory value. The Antarctic chapters are perhaps less distorted, but even there the recent Norwegian work has little notice. There are several good maps. R. N. R. B.

Sir John Franklin's Last Arctic Expedition. By RICHARD J. CYRIAX. London : Methuen and Co. Ltd., 1939. *Price* 12*s.* 6*d.*

The story of the Franklin disaster has been told many times and only recently Mr. Stefansson discussed at length the underlying causes. Nevertheless Mr. Cyriax's book will find a place among polar works of importance. He has gone to endless pains to consult contemporary documents, Admiralty papers and every authoritative work bearing on the expedition. He claims even to have found new material. The result is a scholarly work, well annotated on every page, in which the history of the inception and execution of the expedition and the course of the disastrous retreat are traced step by step. Accuracy and impartiality are notable features, and from Rae onwards every discoverer of any evidence bearing on the disaster has due mention. Scurvy was the main cause of the collapse : this was due to the dependence on preserved food, but while Mr. Cyriax tends to attribute this dependence to lack of game, others, with justification perhaps as great, have attributed it to the unwillingness or inability of the men of the expedition to use the resources of sea and land. The book contains several adequate maps. R. N. R. B.

GENERAL

Admiralty Weather Manual, 1938. By Order of the Lords Commissioners of the Admiralty. London : H.M.S.O., for the Hydrographic Department, Admiralty, 1938. *Price* 10*s.* 6*d.*

This is a compendium of meteorology specially prepared as a guide for those concerned in taking weather observations at sea. Like other official meteorological publications, it should be regarded as a reference book essential to the well-equipped geographical library, for upon the matters which it treats no more authoritative account exists.

The book is divided into three sections, the first dealing with instruments, readings and observations, and the second with general meteorology, which forms the basis of synoptic meteorology treated in the third part. The text is not devoted exclusively to observations afloat, for frequent reference is made to conditions on land, though naturally there is an emphasis upon aspects which concern those on board ship. Of practical use, therefore, are the recognised definitions of such terms as fog and mist, and the standards adopted in determining visibility and the state of the sea. Material from specialised research is included on such topics as fronts and occlusions ; line squalls ; and, of current importance in the survey of new air-routes, the question of ice accretion on aircraft, the conditions under which it is encountered, and some rules for avoiding it (from a paper by Sir G. C. Simpson). Plates, charts and diagrams are used freely to illustrate the text, while as in most books on meteorology nowadays, there is a series of beautiful cloud photographs.

In the first section, observations are classified into instrumental and non-instrumental, the latter dealing with wind, general state of the weather, visibility and cloud. Close attention is paid to the upper winds and upper air temperatures over the sea. It is the second part, however, dealing with the physical aspects of the atmosphere, which is probably of greatest assistance to the geographer, for here are discussed, with a crisp lucidity, the basic principles involved in the study of both weather and climate. In this section winds, naturally, are treated in careful detail, just as later on, tropical storms are closely examined, while several pages are devoted to the description and explanation of special winds experienced in different parts of the world. For the study of climate, the wind-charts of the world for the two half-yearly seasons facing page 202 are excellent in giving a clear idea of the general conditions prevailing over the oceans. Rain and other forms of precipitation, not being of primary interest at sea, receive brief though doubtless adequate attention.

The section on synoptic meteorology discusses the plotting of weather charts, the conditions associated with the different pressure systems, and the importance of the polar front. There is also a general chapter on forecasting, illustrated by

a series of specimen charts, which is of utmost value and at the same time gives completeness to a volume which is distinguished for its scope, accuracy and thoroughness.

K. C. E.

White Settlers in the Tropics. By A. GRENFELL PRICE, with additional notes by R. G. STONE. New York: American Geographical Society, Special Publication No. 23, 1939. *Price* $4.00.

Since the latter part of the nineteenth century the possibilities of white settlement in the tropics have greatly exercised the minds of those who have been concerned with the larger issues of imperial policy. Geographers, despite the apparent relevance of this topic to their subject, have made small contribution towards the clarification of the problems involved, and, with two notable exceptions, they have largely confined themselves to ill-supported generalisations and dogmatic judgments. The survey with which Dr. Grenfell Price now presents us is the product of a careful exploration of the widely scattered literature and of observant travel in tropical latitudes.

The book is divided into three sections. In the introductory chapters the nature of the problem under investigation is defined, and the general history of the advance of European peoples into tropical lands is reviewed. This history is divided into two eras: the pre-scientific period, during which very considerable white settlements were established, often at the cost of great losses of life and capital; and the scientific invasion, dating from the end of the nineteenth century, which differs from the first period by reason of the great advances made in transport and communication, in medical and sanitary science, and in social organisation and control. It is with this latter period that the book is more largely concerned, though the results of the earlier experiments, so far as they are available from historical records, are not neglected.

In Part II, which accounts for more than half of the main text, the author examines the regional experiences of white colonisers in selected parts of the tropics. Defining the tropical zone as the area limited by the annual isotherms of 70° F., he differentiates "the equatorial tropics, the trade wind coasts and islands, the 'wet-dry' (including the monsoonal) areas, the deserts, the mountains and plateaus, and the marginal zones." From this broad tropical province certain areas "that are totally unsuited for white occupation" are excluded from the scope of the survey. These areas embrace the tropical deserts and the humid equatorial lowlands. As presented, these exclusions are somewhat arbitrary and their justification might well have been explained at greater length. There is perhaps an excessive concentration of attention on the lands of Central America and the Caribbean. Florida and Queensland exemplify conditions and experience in the marginal tropics and the trade wind zone; Puerto Rico, Saba, and the British West Indies in the trade wind islands; Northern Australia in the "wet-dry" zone; Costa Rica and East Africa on the high plateaus; and Panama reveals the difficulties of settlers under "almost equatorial" conditions. The treatment of the Australian regions, with which the author is best acquainted, and of Panama, concerning which there is a wealth of historical material, are the most satisfactory. The other regional accounts are more slight, though they are stimulating introductions to these often neglected lands.

The concluding section is concerned to analyse "some factors governing white settlement in the tropics." Three lines of evidence are used: the data provided by history and general observation, the results of statistical research, and the conclusions of laboratory investigations. The analysis opens with a rapid survey of the physiological and psychological content of the term "race," with particular emphasis on the contrasts between the "white" and the "negroid" peoples. It proceeds to a consideration of the constitutional ability of the whites to perform manual labour in the tropics. The racial chapter concludes with some observations on the results of racial mixture. There follows an examination of the environmental factors, isolation, soils and climates, which leads on to a discussion of the possibilities and limits of acclimatisation. The associated problems of

diet, clothing, housing and exercise are briefly treated, and there is a cursory reference to economic and administrative difficulties. The summary and conclusion is mainly a concise statement of the problems raised and the imperfections of data revealed by the enquiry. Four appendices, contributed by Mr. R. G. Stone, deal with some of the physiological investigations which are advancing the understanding of acclimatisation.

This brief notice has attempted no more than an indication of the scope of a study which, in the space of some three hundred pages, surveys with admirable clarity the complexity of its difficult subject. The author has refrained from oversimplification, has set forth the problems which still have to be solved, and has sought, with a large measure of success, to present the opposing evidence of conflicting specialist opinion. To administrators and politicians the book should serve as a useful guide, and to geographers it should be an incentive to explore a field which promises results of great practical value. G. B.

BIOGRAPHY

Livingstone et l'Exploration de l'Afrique. By René Maran. Paris : Gallimard. Eighth Edition, 1938. *Price 25 francs.*

This is a popular, well-balanced account of Dr. Livingstone's work as explorer, medical missionary, and crusader against the slave traffic. It is free from the mass of detail which makes some biographies such heavy reading, yet all the essential facts are woven into the picturesque narrative. It is interesting to note that while claiming for Livingstone a noble ancestry the author accepts the orthodox tradition that his great-grandfather perished at Culloden. Some authorities (differing from the explorer himself) contend that Neil Livingstone, young son of the Baron of Bachuill, escaped scatheless from Culloden to Lismore, Morven, and finally to Ulva. It is a pity that there are typographical errors in the reproduction of the inscription on Livingstone's tomb ; and the illustration of the baobab tree at Shupanga does not correspond with the actual scene to-day.
W. P. L.

I Was There. By Edith Tyrrell. Toronto : The Ryerson Press, 1938. *Price* $2.00.

The autobiography of a Canadian girl who married a Canadian mining geologist, this little book can hardly be of general interest. It consists of an account of the childhood, girlhood, and social life of the authoress in various Canadian towns, mingled with a hurried visit to the Klondyke in 1899, and a slightly longer one in 1903. S.

EDUCATIONAL TEXT-BOOKS

Memorandum on the Teaching of Geography. Issued by the Incorporated Association of Assistant Masters in Secondary Schools. London : George Philip and Son Ltd. Second Edition Revised 1939. *Price* 8*s.* 6*d.*—A good book almost terrifying in its comprehensiveness. Obviously based step by step on actual experience, the book assumes a higher importance attached to the study of geography than is usually found in Scottish schools. As a book of reference it is invaluable and should find a place in every Geography Department.
D. G. S.

The World of Man. Book IV. *Europe, The British Isles and the World.* By C. C. Carter and E. C. Marchant. London : Christophers Ltd. *Price* 3*s.* 9*d.*

Geography for To-day : North America and Asia (also issued separately) : *Europe and the British Isles* (also issued separately). By a Committee including L. Dudley Stamp and L. S. Suggate. London : Longmans, Green and Co. Ltd., 1939. *Price*, 4*s.* each, or 3*s.*, 2*s.* 6*d.*, 2*s.* 9*d.* and 2*s.* 9*d. respectively.*

NEW MAPS AND ATLASES

EUROPE

SCOTLAND.—Ordnance Survey of Scotland.—Publications issued from April 1st to September 30th, 1939.

Six-inch Scale Maps (revised). Quarter Sheets with Contours in Red. Price 2s. each. *Lanarkshire*—6 NW. (1932-33), 11 NE. (1935-36).

1 : 2500 Scale Maps (revised). With Houses stippled and with Areas. Price 6s. 8d. each. *Angus*—53 : 8 (1937), 54 : 1 (1937). *Ayrshire*—16 : 7 (1937), 18 : 14 (1937), 9 (1937-38), 16 : 4 (1937-38), 6 (1937), 23 : 2 (1937). *Dunbartonshire*—23 : 6 (1937), 8 (1937), 23 : 15 (1937), 16 (1938), 24 : 1 (1938), 5 (1938). *Lanarkshire*—1A : 15 (1937), 16 (1938). *Stirlingshire*—32 : 1 (1938), 5 (1938).

Geological Survey of Scotland.—The following maps are now available mounted in sections to fold in covers.

One-inch Maps, New Series, Colour Printed, Solid Edition. Price 4s. 6d. each. *Ayrshire*, N. 22 ; *Edinburgh*, 32 ; *Glasgow District.*

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